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Environmental assistance for small businesses: Best practices for maximization of small business participation in state funded environmental compliance programs

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ENVIRONMENTAL ASSISTANCE FOR SMALL BUSINESSES: BEST PRACTICES FOR MAXIMIZATION OF SMALL BUSINESS PARTICIPATION IN STATE FUNDED ENVIRONMENTAL COMPLIANCE PROGRAMS

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TABLE OF CONTENT

ENVIRONMENTAL ASSISTANCE FOR SMALL BUSINESSES: BEST PRACTICES FOR MAXIMIZATION OF SMALL BUSINESS PARTICIPATION IN STATE FUNDED ENVIRONMENTAL COMPLIANCE PROGRAMS

by

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ABSTRACT

Small businesses face many challenges as they strive toward growth and profitability. Adding to this challenge is the demand for improved environmental performance. Pollution prevention is often the most cost effective way to improve environmental performance. Yet, small firms often lack the expertise they need to pursue pollution prevention opportunities. There are a number of state agencies in New York that provide assistance and funding to small businesses to implement pollution prevention strategies. They often work in collaboration with nonprofit organizations that provide on-site technical assistance and consultancy to small businesses. It is up to the small business management to decide whether they want to get involved in these programs. This thesis explores how the state grants are being used by small businesses to adopt pollution prevention practices and technologies, and what are the major criteria that influence small business management's decision to voluntarily participate in these state funded projects.

Abbreviations

EPA – Environmental Protection Agency

P2 – Pollution Prevention

GAO – General Accounting Office

NIST – National Institute of Standards and Technology

ESD – Empire State Development

ESU – Environmental Service Unit

HTR – High Technology of Rochester

MEP – Manufacturing Extension Partnership

RIT – Rochester Institute of Technology

SBA – Small Business Administration

DEC – Department of Environmental Conversation

SME – Small and Medium Sized Enterprises

TRI – Toxic Release Inventory

1. Introduction

1.1.Statement of Topic

Small businesses face many challenges as they strive toward growth and profitability. Adding to this challenge is the demand for improved environmental performance. Many small and medium size firms lack the knowledge and ability to identify potential problems within their environmental aspects of business. Although pollution prevention is often the most cost effective way to improve environmental performance, the small firms often lack the expertise they need to pursue pollution prevention opportunities. There are a number of state agencies that provide assistance and funding to small businesses to implement pollution prevention strategies. They often work in collaboration with nonprofit organizations that provide on-site technical assistance and consultancy to small businesses. It is up to the small business management to decide whether they want to get involved in these programs. This thesis explores how the state grants are being used by small businesses to adopt pollution prevention practices and technologies, and what are the major criteria that influence small business management's decision to voluntarily participate in these state funded projects.

1.2. Significance of the Study

Small businesses make a significant contribution to the economy; they make up the vast majority of firms in the United States. Indeed, over 99 percent of all U.S. companies (almost 23 million of them) are "small" by government definition (Willax, 2000). According to government definition, a business is considered "small" if it has less than 100 employees and less than $5 million annual sales. The Small Business Administration (SBA) found that when the economy demands progress, change and evolution, small firms act as sources of constant experimentation and innovation (Senate Committee on Small Businesses, 1999). "They are an integral part of the renewal process that defines market economies. They have a crucial role as leaders of technological change and productivity growth," (Senate Committee on Small Businesses, 1999).

Although small businesses are a critical part of the economy, their environmental impact is largely unknown. It is often assumed that small firms cause small impacts on environmental pollution, but if the number of small businesses throughout the country is taken into consideration when estimating their overall impact on environmental, the results can be surprising. Moreover, there is a trend towards higher numbers of small businesses in the USA: Willax (2000) estimates that the number of small firms is expanding at a rate of between 2 percent and 3 percent per year, a number that is higher than the grown rate of the population and work force in general.

Coglianese and Nash (2002) note that this growning collective number of small firms may mean that their environmental impacts are substantial, particularly at local levels. They state: "Photo processors, dry cleaners, printers, and other businesses that utilize hazardous materials and generate significant quantities of waste often operate out of small establishments," (Coglianese and Nash, 2002).

Given the importance of small and medium sized firms to the economy, and their potential environmental impact, it is necessary for small companies with limited financial and technical ability to have access to the updated information on environmentally friendly innovations. State funded technical assistance programs increase the awareness of small business managers about pollution prevention practices.

1.3. Reasons for Interest

It is important to know what factor drive the managers voluntarily participate in the projects directed to reduce pollution and prevent overall environmental degradation. In the course of exploring the answers for the questions raised throughout this thesis, my purpose was to figure out what do small business managers think about the environment and what actions do they take to protect the surrounding nature. In particular, this thesis focuses on the criteria that influences small business manager's decision to participate in state funded environmental projects. The projects, described as case studies in the thesis, are not about compliance with regulations and laws; they are about helping companies voluntarily

go beyond the compliance, which would be profitable for the business in the long run.

The thesis also explores the ways the state agencies approached small business management and convinced them that it was in their interest, as well as companies' interests, to implement pollution prevention strategies within firms' internal operational processes. While outlining the major criteria for participation in P2 programs, it became apparent that small businesses which lacked expertise, technical knowledge and the financial ability to operate with less harm to the environment also lacked the ability to determine appropriate waste reduction opportunities within the environmental aspect of their business.

2. Background

2.1. Pollution Prevention

Each year American industry generates billions of pounds of toxic waste, which can pose risks to the health of workers, customers, and the public. Over the past 20 years, federal and state regulations, industries, organizations and environmental agencies have increasingly focusing on reducing pollution by avoiding the creation of pollution at the source, rather than end of pipe abatement. The approach to solve pollution problem at its source is commonly known as pollution prevention (P2).

The concept of pollution prevention was first discussed 1977 when US EPA and the US Commerce Department held regional conferences to promote dialogue on this topic. Michael Royston (1979), the author of the book called "Pollution Prevention

Pays", describes that pollution prevention is a way to see environmental protection and economic progress as complementary, not competing, goals. As described for the California Air Resources Board: "Each molecule of raw material which becomes a pollutant is lost product. Each dollar spent to landfill waste, treat air emissions or manage other waste is lost profit. Pollution which is never created does not need to be recycled, treated or disposed" (California Air Resources Board, 1999).

2.2. EPA Pollution Prevention Programs

The adoption of the Pollution Prevention Act in 1990 further strengthened the application of pollution prevention. The policy of this Act, as described in the United States Code (Title 42 the Public Health and Welfare) is:

- pollution should be prevented or reduced at the source whenever feasible;
- pollution that cannot be prevented should be recycled in an environmentally safe manner, whenever feasible;
- pollution that cannot be prevented or recycled should be treated in an environmentally safe manner whenever feasible;
- disposal or other release into the environment should be employed only as a last resort and should be conducted in an environmentally safe manner.

EPA created the P2 grant program under the authority of the Pollution Prevention Act of 1990. The grant program provides matching funds to state and tribal programs to support P2 activities across all environmental media and to

develop state programs. EPA believes state-based environmental programs have the best opportunity to promote P2 because states have closer, more direct contact with industry and are more aware of local needs. The purpose of the P2 grant program is to give state programs the capability to assist businesses and industries in identifying better environmental strategies and solutions for complying with federal and state environmental regulations. It also aims to improve business competitiveness without increasing environmental impacts (Environmental Protection Agency, 2003).

The EPA has developed and maintained an ongoing relationship with the small business community. The agency works to promote understanding of environmental policy, resolve disputes and offer guidance while also addressing the needs and concerns of small businesses. The EPA makes funding and expertise available to small businesses engaged in developing cutting-edge technologies that reduce pollution and protect the environment (EPA, 2004).

2.3. Some Criticism of EPA Pollution Prevention

Some of the states have been successful in implementing the Pollution Prevention program and complying with the regulations, some are in process of implementation, and some states cover only limited number of companies and industries. Despite the potential advantages of pollution prevention programs, implementation efforts face significant challenges. General Accounting Office (GAO) comes to the conclusion that limited quantitative data exists on the extent to which American industry has sought to use pollution prevention methods to reduce

pollutants discharge from its facilities. They state: "Nonetheless, targeted studies conducted by individual state agencies and other organizations and a widespread consensus among industry participants, regulators, and analysts strongly suggest that additional cost-effective opportunities exist for pollution prevention that could help companies fulfill their environmental requirements" (GAO, 2001, p. 23).

Although EPA promotes voluntary participation of companies in pollution prevention programs, Citizens Fund, an affiliate of Citizen Action and an environmental watchdog group criticized the EPA: "EPA's voluntary pollution prevention program is a 'sham,' and should be shut down," (*Anonymous*. Occupational Hazards, 1994).

One of the EPA's project -- known as the 33/50 program -- called on companies to reduce toxic emissions of 17 chemicals 33% by 1992, and 50% by 1995. Citizen Action stated that 33/50 did not prevent pollution as it alleged because it intermingled prevention measures with control measures such as waste incineration, burning for energy recovery, recycling, and production cutbacks; and entered production changes (including plant closings) and estimates of Toxic Release Inventory figures into the pollution prevention equation. Citizen Action said that many companies have cut their toxic waste at the source, but these efforts were underway before the Bush Administration initiated the program in 1991. It was revealed that in most cases reduction goals that facilities set before the EPA initiative were higher than reduction targets set by the 33/50 program. (*Anonymous*. Occupational Hazards, 1994).

Bob Pojasek, vice president of GEI Consultants, is also skeptical about stories of pollution prevention from companies, regulators, product purveyors, technical assistance programs, and others. His criticism and skepticism was in response to a case study about a closed-loop wastewater recycling system that had been installed at a printing plant. He observes: "Instead of devoting the time and effort to examine its options for solving the basic problem of waste, evaluating them, and then choosing the best ones, a company often just buys a system to solve the problem." (Anonymous. Environmental Manager, 1993) He recommends that instead, engineering consultants can be used to act as independent insurance agents and give companies a number of different options, such as recycling, some materials substitution, some operation changes, and some options that involve different technologies (Anonymous. Environmental Manager, 1993).

Another critique of EPA came from President-elect Bill Clinton's nominee to head the Environmental Protection Agency Carol Browner. She said that she hopes to open a new era of communication between the EPA and America's business community and to ease unnecessary delays in adopting regulations (Abramson, 1993). During her meeting with the Senate Environment and Public Works Committee Ms. Browner said: "The adversarial relationship that now exists ignores the real complexities of environmental business problems. It creates damaging delays in the regulatory process and often unnecessarily harms business without significantly aiding the environment." Mr. Browner recommended that the agency should deliver quick, consistent decisions and must recognize the special problems

of small business. She added: "The EPA should spend more time listening to the particular concerns of business and communities affected by environmental problems. The EPA should promote, encourage and develop rewards for businesses that develop pollution prevention and recycling strategies."

2.4. States' approach to implement Pollution Prevention Programs

Every state in the US offers some type of technical assistance to help industries adopt pollution prevention innovations. These programs vary in intensity from simple distribution of literature (such as case studies) to on-site industrial site assessment, technology demonstration, and feasibility studies. In this section I will review some of these programs in order to illustrate the differences that exist among programs.

In Alabama, the P2 program is under the Alabama Department of Environmental Management. The peculiarity of this department is that it gives an award in Pollution Prevention to Alabama businesses and industries that have enjoyed success in protecting the environment and public health through pollution prevention. Activities of note include pollution prevention/source reduction in the areas of air emissions, hazardous and solid waste, wastewater and toxics (Alabama Department of Environmental Management, 2003).

In Arizona, the P2 program is monitored by Arizona Department of Environmental Quality. They outlined the key points for creating a successful pollution prevention programs. They point out that facilities should have a clear

understanding of their pollution prevention direction, e.g. have a definition of pollution prevention, and have either a facility or corporate pollution prevention policy. They say that facilities should have pollution prevention goals and use a champion or facilitator or focal point person to lead the program (Arizona Department of Environmental Quality, 2003).

In Colorado, the Pollution Prevention Program is located within the Sustainability Program at Colorado Department of Public Health and Environment, It is dedicated to promoting and supporting long-term process improvements and best management practices that reduce or eliminate waste before it is generated in household, commercial and industrial sectors. They focus more on developing and promoting strategic and innovative pollution prevention projects and sustainable practices within Colorado businesses (Colorado Department of Public Health and Environment, 2003).

The Kentucky Pollution Prevention Center (KPPC) helps organizations increase efficiency and profitability by identifying opportunities for waste reduction and other methods for improving environmental management. They are not only offering training on diverse topics such as Solid Waste Reduction and Buy Recycled, Environmental Cost Accounting, Lighting Waste Management, Managing Your Medical Waste, Wastewater Pretreatment, but also provide on-site technical training. The Center's technical staff is extremely knowledgeable in the fields of chemical, civil, environmental, industrial and mechanical engineering, geology and P2 (Kentucky Pollution Prevention Center, 2003).

The Minnesota Pollution Control Agency's Pollution Prevent and Sustainability (P2/S) Program works with customers and partners to: increase the use of pollution prevention techniques and technologies; promote the economic benefits of pollution prevention and enhanced analysis of full environmental cost; and uses agency regulatory products and new innovation programs as levers or incentives for use of pollution prevention techniques and strategies for improved environmental outcomes (Minnesota Pollution Control Agency, 2003). On their website they post a successful stories and individual case studies by topic.

New York State Department of Environmental Conversation (DEC) offers Pollution Prevention Technical Assistance. Some interesting features of this program is that if a company has undertaken a successful pollution prevention project, they can apply for the Governor's Award. New York Governor's Award has been in force since 1994. Their website has a link to all the awards, separated by year, and whether it is small business or large business. New York State also has Small Business Self-Disclosure Policy This document discusses DEC's policy for adjusting penalties for small businesses who detect, voluntarily disclose, and expeditiously correct certain violations discovered through environmental audits or compliance assistance (New York State Department of Environmental Conversation, 2003).

From the brief overview of pollution prevention implementation methods and strategies in different states we can see that even if the major goal of P2 programs is helping businesses to implement the environmental innovation, every state takes different approach towards reaching the goal.

2.5. Manufacturing Extension Partnership and its Technical Assistance Programs

While much focus has been placed on government run technical assistance programs, there are other programs designed to help firms improve their environmental performance beyond compliance. Many of them are collaborations between private organizations and the government. Government participation does not need to come from the EPA. With an increased awareness of the competitive advantages of pollution prevention, as seen in the next two sections, technical assistance programs are increasingly being seen at the state level, and are being supported by other areas of government.

One such organization that is relevant to this thesis is the Manufacturing Extension Partnership (MEP). MEP is a nationwide network of not-for-profit centers in over 400 locations nationwide, whose sole purpose is to provide small and medium sized manufacturers with the help they need to succeed. The center serves all 50 states and they are linked together through the Department of Commerce's National Institute of Standards and Technology. Centers are funded by federal, state, local and private funds to serve manufacturers. That makes the possibility for even the smallest firms to gain the expertise of knowledgeable manufacturing and business specialists all over the United States. These specialists are people who have had years of experience working with manufacturers and plant operators. Each center works directly with different manufacturers to provide expertise and services aimed to their most critical needs, which range from process improvements and worker

training to business practices and applications of information technology (Manufacturing Extension Partnership, 2004).

3. Literature Review

3.1. Government's Approach to Small Businesses

The US Congress findings on Chapter 33 – Pollution Prevention state: "The opportunities for source reduction are often not realized because existing regulations, and the industrial resources they require for compliance, focus upon treatment and disposal, rather than source reduction; existing regulations do not emphasize multi-media management of pollution; and businesses need information and technical assistance to overcome institutional barriers to the adoption of source reduction practices."

The US government has played an important role preventing pollution by regulating the industrial toxic releases. Since 1987, the EPA has published a Toxic Release Inventory (TRI), which has shown a steady decline in the amount of 300 dangerous chemicals that were released by the US firms. One company executive told EPA officials that he had no idea how much of valuable resources he was wasting until he saw the TRI report. Based on the results of the TRI program, a BioCycle article concluded that "if the regulatory system stays the same, there's expected to be a tremendous reduction in the amount of hazardous and non-hazardous wastes generated," (Goldstein, 1995).

Federal and state governments attempted to mandate the companies to demonstrate a good environmental performance. However, various non-profit organizations significantly contribute into the process. These organizations run an increasing number of voluntary programs to assist in small and medium size businesses with their economic and environmental performance. For example, the non-profit organizations at State, regional and local levels that help companies to implement environmentally friendly practices within their facilities. They receive inquiries from the companies who tell that they are interested to become ISO certified; that they are interested in improving the environmental standards.[1] John Morelli, associate professor of environmental management at Rochester Institute of Technology assesses this phenomenon as driven by consumer demand. He states: "Not because they think that protecting the environment is good thing but because big companies require that in order to be one of their top suppliers they have to have environmental management system in place."

3.2. Businesses' Approach to Participate in Pollution Prevention Programs

There are several reasons that underline businesses' voluntary participation in pollution prevention programs: a) to reduce production costs; b) to stay competitive; c) to increase environmental protection and improve long-term compliance rates. Marvin Fleischman, a professor from University of Louisville who was involved in waste minimization programs, wrote: "If you eliminate a hazardous waste, then you

[1] Morelli, John. Personal interview, Rochester, NY, 13 January, 2004

eliminate the exposure of your workers to that waste. And, the public image of the company can be enhanced. The liability is reduced if you don't put a hazardous waste in a landfill. Also you have to consider the fact that the company will not have to deal with waste disposal regulations and permits, which is not necessarily a dollars issue, it's a hassle," (Goldstein, 1995).

3.3. Some of the Earlier Identified Potential Criteria for Small Business Participation in Environmental Programs

There are a number of factors that influence the degree to which firms adopt new environmental innovations. Hansen, Sondergard & Meredith (2002, p. 42) group these factors into six categories: Business characteristics, character of the environmental innovation, firm perception of environment, motives and environmental strategies of the companies, importance of external and internal relations, actors and factors impending or supporting the adoption, and commercial and environmental results. Using these categories as an organizing framework, I will briefly describe some of these factors as they apply to the adoption of environmental practices in small and medium size companies.

3.3.1. Difference of perception of environmental innovation

The idea of something new is sometimes frightening. For example, for a long time people feared and were frightened by the idea of going to the space. It was uncertain for many years whether there is a life somewhere else, beside the earth. The idea of introducing a new technology is the same fear and uncertainty, only on a

smaller scale. Lindsey (1998), manager of the pollution prevention program at the Illinois Department of Natural Resources, in his article "Diffusion of Pollution Prevention Innovations" through comparison of pertinent literature regarding the diffusion of innovations, attempts to offer some explanations for this relatively slow rate and some insights on speeding up with diffusion of environmental practices. He compares pollution prevention to other preventive innovations such as contraceptives, mammograms, stopping smoking, using seatbelt, buying insurance, and emergency. He wrote that, these preventive innovations may be unpleasant and their results may not be easily observed. "P2 innovations have been diffusing relatively slowly, in part because they are frequently perceived as preventive innovations. The advantages of P2, like those of other preventive innovations, tend to occur in the unknown future" (Lindsey, 1998, p. 2). Lindsey discusses the concept of "Individual Perception". He says that individual perception about an innovation is usually more important than the actual technical aspects. He writes that late adopters are simply traditionally resistant to change, or that they are irrational.

3.3.2. Motives and environmental strategies of the companies

In order to implement something new we should first understand the motives and environmental strategies of the companies, e.g. what forces the firms to adopt environmentally friendly practices within their? Noci and Verganti (1999) identify three strategies that make company to integrate environmental issues into their corporate strategies. In some cases, companies are taking "a follower strategy," which means that in order to maintain the business they must comply with legal and

regulations requirements (p. 5). There are situations when firms are following market-oriented strategy; innovation-decisions and environmental actions are derived from specific market and competitive choices. And the last group of companies perceives the environment as a key factor in their corporate strategy; in other words they follow an environment-oriented strategy.

Hansen, et al. (2002) describes the adoption and diffusion of environmental innovations amongst small and medium sized enterprises (SMEs). This article tells us about difficulties and constrains faced by the enterprises inside the business. Authors come up with case studies in European countries, which would be good source of information further in my research. "Adoption of environmental innovations is decided upon and takes place within the context of an organization's values, routines, preferences and strategies. Therefore, understanding adoption as an organizational process becomes essential" (Hansen, et al., 2002, p. 38).

3.3.3. Importance of external and internal relations

External and internal relations of the company play a big role in the implementation of environmental projects within the company infrastructure. John Cross (2002) in his article "Environmental Justice through Pollution Prevention" discusses Environmental Justice/Pollution Prevention grants programs and its implications for the future progress. The author outlines the basic obstacles and barriers to successful P2 projects:

- Businesses lack staff to focus on environmental issues. Small companies have little environmental expertise, and current staff, whether workers or owners, do not have much time for anything beyond ensuring compliance.
- Businesses mistrust pollution prevention service providers. Businesses often fear that outsiders may discover environmental violations and report them to the authorities.

It is easy to understand why businesses in poor, minority, urban areas are often small, not regulated well, non-unionized, and use immigrant labor. Most of these businesses stay anonymous. They do not have enough money to comply with regulations, and do not want to take the risk of having illegal practices exposed, because they will no longer be in business. "Working with these businesses usually takes longer time to build a relationship of trust and to enable grantees to develop the organizational capacity for addressing these issues" (Cross, 2002, p. 59).

Todd Dresser (2001), an environmental engineer for the Board of Health in the Town of Burlington, Massachusetts, in his article "P2 and compliance Assistance: A Municipal Approach" briefly describes the Burlington Pollution Prevention/Compliance Assistance Forum, and explains how it overcame some initial difficulties to earn the trust and support of local industry. They have invited all local businesses to participate in the program. In particular, they "sought the participation of small to medium-size firms that lack compliance staff and that routinely handle and utilize hazardous materials" (Dresser, 2001, p. 16). By providing an anonymous, non-confrontational setting, they have created an

opportunity for small businesses to meet with regulatory personnel to discuss compliance issues and ways to promote pollution prevention. Dresser notes, that he "soon realized that the key to the problem was a general lack of understanding on the part of both the business community and government agencies" (p. 17). The results of the forum were fruitful; the program has enabled to provide business participants with P2 and compliance assistance information they need but often are afraid to request. They helped local businesses implement pollution prevention practices that result in immediate cost saving or process modifications that improve occupational safety and decrease regulatory risk.

3.3.4. Actors and factors impending or supporting the adoption

Lindsey (1998) talks about the importance of change agent in the implementation of pollution prevention and his correct understanding of his responsibilities. Rogers (1995) defines a change agent as "an individual who influences clients' innovation-decision in a direction deemed desirable be a change agency" (p. 27). As described by Lindsey, the role of a change agent is not an easy one. He states: "A change agent finds it difficult to understand why companies do not immediately discontinue existing practices and change their operations to adopt pollution prevention methods" (p. 4). Instead of helping their customers find ways of accomplishing the necessary process analysis, many P2 change agents blame the customer for being resistant to change or irrational (Lindsey, 1998). Even if a change agent usually seeks to obtain the adoption of new ideas, he/she may also attempt to slow down diffusion and prevent the adoption of undesirable innovation. Lindsey

(1998) adds that P2 change agents often encourage clients to adopt pollution prevention principles and technologies without helping them fully evaluate their own processes or how the innovation will actually be implemented.

3.3.5. Regulations

The decision of a company to become involved in pollution prevention or environmental compliance program can also be influenced by regulations. While many small businesses are imposed by few regulations, the regulations still may play a role in the pollution prevention decisions of a firm. Research has been conducted to find out whether government regulations promote the environmental innovation or hinder the companies from involvement in P2 programs. In an article reporting their research Hansen, Sondergard & Meredith (2002) wrote that "new regulations encouraging the use of cleaner technologies and self-regulation have had limited success in promoting the diffusion of environmental technologies amongst small and medium enterprises, even where both commercial and environmental benefits occur" (p. 37). United States General Accounting Office (2001) in its report to Congressional Budget writes that environmental laws and regulations can play a key role in promoting pollution prevention in at least two ways.

> "First, some regulations may prompt companies to adopt pollution prevention practices in order to keep emissions below regulatory thresholds. In some cases this allows them to avoid potentially costly and time-consuming permitting process, in other cases it precludes the need to install costly emissions control technology. Second, regulations may encourage pollution

prevention in instances when firms emission standards are set, yet companies are given the flexibility to determine how best to meet such standards. For example, company might increase its research and development expenses for a discovering a better emission reduction practice, which will help them cost-effectively meet environmental regulations" (United States General Accounting Office [GAO], 2001, p. 7).

3.3.6. Commercial and environmental results

It is difficult for the company to assess whether the implementation of innovation will be significant from both commercial and environmental sides. Companies have to seek for how to improve the environmental performance without negatively affecting the profitability. Rogers (1995) states that awareness knowledge alone does not usually provide the necessity information for adoption of the innovation. Customers need to know how to innovate; they need to see on-site demonstration. Another problems flow out from here is that adaptors find it difficult to observe the results and benefits of innovation, because it occurs in the future, unknown time. As stated by Hansen et al (2002. p. 39): "Similar uncertainties surround the organizational consequences of innovation and rapid technical development, and can cause potential adopters to wait for promising alternatives." The concern rather to adopt a new technology or not, can also depend on cost: how much equipment will cost; where do the small companies get money; will it be profitable in the long run. Thus, adoption of new technology, results in uncertainty.

4. Methods for analyzing the problem

4.1. Identification of Research Strategy

In my study, I aim to identify the criteria that influenced small business managers' decision to participate in waste reduction projects. Determination of criteria will assist in identifying the best practices for small business participation in pollution prevention programs. To determine these criteria I will describe three projects. The purpose of these projects was to provide financial and technical assistance to small and medium size businesses in Finger Lakes Region. These projects will serve as the separate case studies for my in-depth research. The projects analyzed in case studies are:

CASE STUDY 1 – Rochester Institute of Technology, Eliminate Waste, Allowing You Savings (1997-1998) (RITEWAYS$)

CASE STUDY 2 - High Technology of Rochester Business Waste Reduction Project (1999-2001)

CASE STUDY 3 - High Technology of Rochester Business Waste Reduction Project (2001-2003)

Depending on the year the project was conducted, I will describe each project in the chronological order. The projects were implemented by different organizations located at Rochester, New York. Most of the information needed for the description and analysis of each case study was obtain via personal interviews,

telephone calls and email correspondence with the project supervisors of each project. I also interviewed a representative from the state agency, New York State Empire State Development (ESD). The ESD provided partial finance for all three projects. I will outline the factors that determined the small businesses' capability to engage and carry through environmental innovation adoption processes.

The case study 1 is the study of the "Eliminate Waste, Allowing You Savings" project. This project was conducted by several experts and analysts in the Rochester area, and eight students from the Rochester Institute of Technology (RIT). The case study 2 and case study 3 were conducted by High Technology of Rochester (HTR). HTR is an independent, not-for-profit organization that provides businesses with information to key resources, consulting and training. Under the Business Waster Reduction projects HTR was responsible for implementation, promotion, and monitoring of waste reduction practices.

Each case description will describe the approach project supervisors took to address the companies. The analysis of each case study will describe the problems faced by the project supervisors at different stages of implementation of these environmental projects. I will also outline the major criteria upon which company managers based their decision voluntarily participate in state funded projects. Finally I will give separate recommendations to: a) the managers of small businesses; b) the managers of assistance organizations; c) for government.

4.2. Organizations Involved in the Projects

In my research I will also analyze the organizations that were directly involved in my project. These agencies are located in the Finger Lakes Region. Following are the organizations, which were responsible for providing financial and technical assistance to the companies participated in these project:

- New York State Empire State Development Environmental Service Unit
- High Technology of Rochester / Manufacturing Extension Partnership

Detailed description of these organizations' involvement in the projects will be found in case studies descriptions.

4.2.1. New York State Empire State Development

The New York State Empire State Development (NYS ESD) is state's economic development agency. The ESD works with businesses of all sizes, small or large, which are thinking of doing projects. The most important criteria of ESD is to create or retain jobs. As a state agency, it obliged by law to report to a Governor. The organization provides grants, loans, and other forms of assistance for companies, who want to expand and create new jobs.[2]

The Empire State Development encourages and supports activities that both strengthen the State's economy and protect and preserve the environment. To accomplish this, the ESD offers a range of resources to help businesses identify and transform environmental concerns into market opportunities and competitive advantages (Empire State Development, 2004). The ESD developed an Environment Investment Program, under which it funds diverse projects. The organization

describes its service as: "Through its Environmental Services Unit (ESU), ESD provides New York State businesses with the tools they need to understand and comply with environmental regulations and provides financial assistance for investments in projects that improve business productivity and competitiveness through enhanced environmental performance" (Empire State Development). In order to fund a certain project, ESD needs to consider carefully applications and assess them before final approval. The environmental manager from the New York State Empire State Development, Mr. James Gilbert describes the mission of the department he works for in the following statement: "Within the ESD, I work for Environmental Services Unit, which does not exactly share the same mission as the bigger office. The Environmental Services Unit is about helping companies with P2 projects, and we do not really cover issues related to local job expansion directly as much as the rest of the organization does. ESD is all about making things economically viable. Environmental Services Unit is about making Pollution Prevention economically viable."

4.2.2. High Technology of Rochester

The High Tech Rochester (HTR) was initiated by the Greater Rochester Metro Chamber of Commerce (now the Rochester Business Alliance (RBA), Inc.), the University of Rochester, and the Rochester Institute of Technology in 1987. Its goal has been to support the formation of new businesses based on innovative products and systems (High Technology of Rochester, 2004).[3]

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[2] Gilbert, James. Personal interview, Rochester, NY, 5 January, 2004

The HTR is an independent, not-for-profit organization that serves technology-based businesses with training, consulting and connections to key resources. Its corporate sponsors include the Rochester Business Alliance, academic institutions, corporations, professional services firms, and local and state government. Two basic objectives of the HTR's mission are as follows:

- To stimulate growth of the Greater Rochester technology-based business sector by actively facilitating the identification, development, and incubation of new business opportunities;
- To help small and mid-sized Finger Lakes manufacturers identify and implement pollution prevention and waste reduction opportunities.
- To improve the competitive position of small manufacturing companies through product and process innovation (High Tech of Rochester, 2004).

4.2.2.1. Manufacturing Extension Partnership

The High Technology of Rochester also administers the Manufacturing Extension Partnership (National Institute for Standards and Technology (NIST) Manufacturing Extension Partnership (MEP)). Through the Manufacturing Extension Partnership, HTR provides technical support to small and medium sized manufacturing companies in the Finger Lakes region, which are in need of expert technical and financial advice. Their team of engineering and manufacturing professionals provides assessments, benchmarks and consulting to help clients

increase productivity and quality. They help companies to access State grants and low cost funding to support Lean Manufacturing improvements.

The MEP project leaders help companies with:

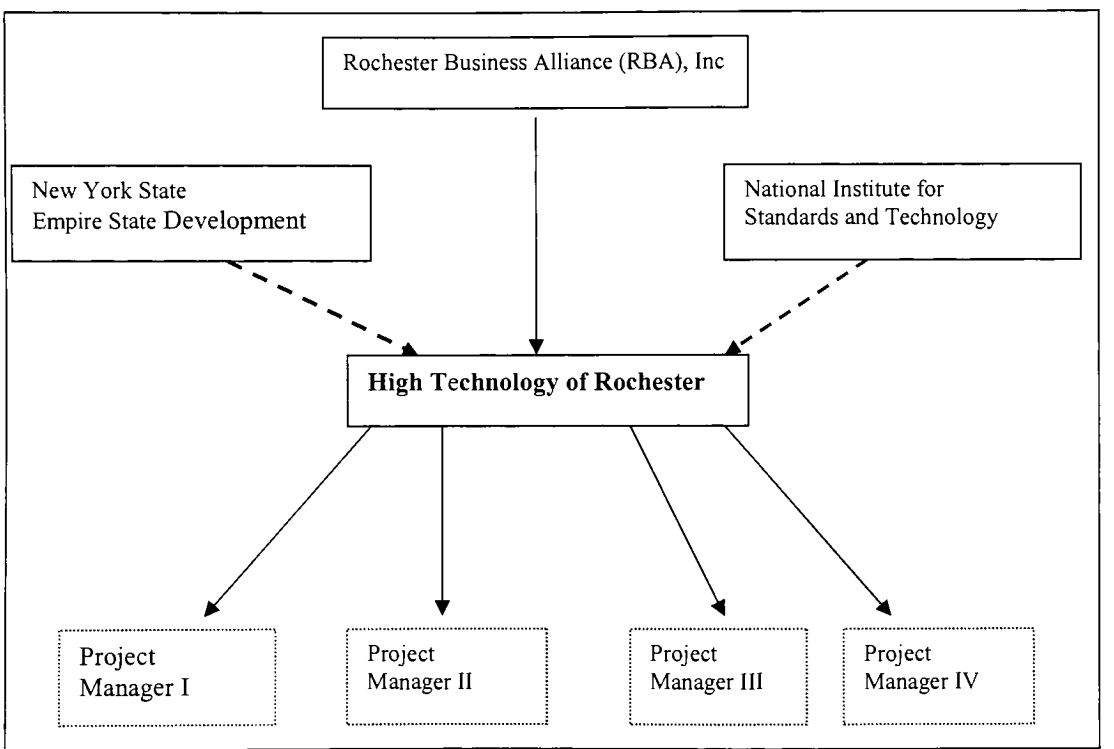
- Manufacturing Assessments
- Lean manufacturing Training & Implementation
- Quality Management Systems
- Financial Assistance Administration
- Executive Coaching
- Safety, Health & Environment Consultation and Training
- Waste Assessments
- Workforce Training

Over a 10-year period, the HTR has worked with 1,100 technology-based companies. According to a survey undertaken in 1997, employment had increased 2 1/2 fold and sales had grown from $18 million to $61 million. The survey included a sample of 35 companies, that had been consistently involved with the HTR over a 3-year period. The HTR has also worked with 571 small manufacturers and assisted them in making needed changes. It was also successful in acquiring $2.6 million of the New York State Industrial Effectiveness Program funds to assist 75 of these

manufacturers employing 10,000 people to implement the adjustments for improvement (High Tech of Rochester, 2004). More specific information about what the organization does is given at their website: http://www.htr.org.

Figure 1 presents the organizational chart of High Technology of Rochester.

Figure 1. Organizational Structure of High Technology of Rochester.[4]



Waste Allowing You Savings

The case study 1 is the study of the "Eliminate Waste, Allowing You Savings" project. This project was conducted by several experts and analysts in the Rochester area, and eight students from the Rochester Institute of Technology (RIT). In my description I will abbreviate it as "RITEWAYS$" because it stands for the Rochester Institute of Technology, Eliminate Waste, Allowing You Savings.

Project Background

The RITEWAY$ Program was designed as a waste reduction assistance service that hired graduate, co-op students studying environmental management to identify and help implement solid waste prevention and recycling opportunities at local businesses (Rochester Institute of Technology, 1998). The RITEWAY$ Project came out of the efforts of a group of RIT students from the department of Environmental Management, who were working on initial project ideas for a class presentation. While it started as a student project, it turned into a project where the students were hired to offer their services to local businesses. Students from RIT, who were involved in the project, were studying Environmental Management. The project lasted for about one year, with the completion date in April 1998. Others who took the responsibility for managing, implementing and continuing the project were as follows:

- Tom Higgins John Morelli, professors from RIT;
- James Gilbert, the Environmental Manager from Empire State Development (ESD);
- George Thomas, the manager of the Environmental, Health and Safety Management system (EHMS) at Kodak Park.

Project Expectations

[4] Krause, Richard. Email correspondence. February 12, 2004

The management team determined the objectives for the project. The following is the range of issues that the project was addressing:

- Provide a permanent, ongoing solid waste prevention service for businesses in Western, NY;
- Develop a methodology for making these services self-supporting;
- Create a tool for training new solid waste professionals, including hands-on experience;
- Address the solid waste and economic impacts of the work on participating businesses; and,
- Produce a documented and transferable solid waste reduction training format (Rochester Institute of Technology, Project Summary, 1998)

The initial goal of the project was to have 10 RIT co-op students achieve $125,000 in savings for the Rochester-area businesses and earn $50,000 in shared-savings from the benefiting companies to help the program become self-supporting and ensure its continuation (High Tech of Rochester, 2004, Project Summary)

Student Training

The RIT students were active agents in assisting the companies. They were all Environmental Management students, thus this sort of project was not novel to them. Prior to the project start, however, RIT put together the "Program Learning and Training" course, so the students could understand such things as assessing

company operations, figuring out the waste problems, and finding the alternatives of where and how should waste be disposed. The project supervisors kept in periodic contact with the students, routinely meeting with them at least once a week to discuss the major points: what were the problems and what were the latest results of the project implementation.[5]

Selection of companies

Many parties participated in the selection of the companies for this project. Specialists who were involved in the project played a big role in attracting the companies. A team with two professors from RIT, John Morelli and Tom Higgins, the manager of the Environmental, Health and Safety Management system at Kodak Park, George Thomas, and the Environmental Manager from Empire State Development, James Gilbert, were the key people involved in the project. They knew some of the companies they contacted, or they knew someone in the company. They advertised with local groups and business councils. The Environmental Management Council, for example, produced and distributed a one-page description about available service and project. The Monroe County Solid Waste Committee also helped with selection of companies for project.[6] Mr. Thomas had most of the contact information. He had an experience working with the issues related to hazardous material and hazardous waste. At that time he was a member of a committee, consisting of his counterparts at many of the businesses around

[5] Higgins, Tom. Personal interview, Rochester, NY, 22 December, 2003
[6] Thomas, George. Personal interview, Rochester, NY, 12 January, 2004

Rochester. He had most of the contacts, and talked to different people about the project and its purpose. "We were looking for some companies to pay for the students' time to come and do the initial assessment. We got some companies to do that. We decided that for other ones, however, we could not get them interested if they had to pay for the service, so we offered the service for free. Depending on the company and the situation, we tried all kind of combinations," said Mr. Thomas.

For those companies that would pay, they needed to identify those firms for which the project would offer a return on investment. Therefore, project tried to approach companies of a range of sizes that had significant amounts of solid waste. The reason was that only companies with significant amount of waste could save some money from participating in the project. Mr. Higgins brings an example: "Companies had to pay $525 per week for student's work. In one year, this number adds up to $6,300. If a company only generates $7,000-$8,000 per a year worth of waste, you can not justify on it."

The focus on solid waste, rather than a broader range of environmental consideration was also made in order to attract some of the larger firms. As explained by Mr. Higgins: "What we worked on was mainly ordinary solid waste. Big companies, like Kodak, had other legally sensitive issues to deal with, such as hazardous waste or air emissions, and they have a department to work with these environmental issues." Because of the internal expertise and the sensitive nature of some of the more regulated aspects of environmental performance, the project team

found that firms were more interested in working on less legally sensitive issues, such as solid waste reduction.

The decision of a company to participate in this project also depended on targeting appropriate decision makers, e.g. whom the project supervisors addressed at the company level. Mr. Thomas describes: "In a company, if you talk to the environmental person, you probably will be stricken out, because the environmental person perceives that to be his/her job. Sometimes we tried to approach the environmental person, who would usually be in charge of waste at the plant. They would not be interested in help from anybody because, I think, it might suggest to others in their company that they did not know how to do the job. So they were not interested. Thus, finding the right person in the plant was very important...If you talk to a purchasing person, who pays the bills for disposal of that waste, they might be more interested."

Approach

The first phase in the project was that students went to each company and completed a waste analysis. They had to identify the opportunities to reduce the waste, which would eventually lead to saving money. "Dealing with reducing solid waste is an economic issue; it costs money to get it taken away. Everything you put in the trash, you have paid for it. And if you reduce the waste, you reduce what you are buying. So it really is an economic issue, when it comes to solid waste," said Mr. Higgins. It did not matter what the industry sector of the company was; students

looked at whole operation: at every step included into the process of companies' operations. The questions they had in mind while making tours to the companies were:

b) where was waste generated?

c) where was waste coming from?

d) where did waste end up going to?

During the process assessment project supervisors and students looked at companies' invoices and all available information. They walked around the plants, and identified where the biggest waste related problems were and where the best opportunity to go afterwards was.[7]

Firms benefited a great deal even from this initial analysis. When project supervisors and students approached a company and talked about the waste generated within a company facility, companies tended to watch the production and operation process more carefully. "If they are watching anything, they are watching production efficiency," observes Mr. Higgins. Looking at waste gave managers a different prospective on the company's production efficiency. For example, one company's production reports understated their waste and therefore overstated their efficiency. The weight of waste measured showed this understatement.[8]

The results also often showed the importance that waste generation had on overall company performance. Faced with these results, company management could

[7] Higgins, Tom. Personal interview, Rochester, NY, 22 December, 2003
[8] Higgins, Tom. Personal interview, Rochester, NY, 22 December, 2003

not but realize the significance of the waste generated within their facilities. Mr. Higgins describes this approach: "A lot of times internal records understate the amount of waste the company generates. The production operators might not notice the amount of waste generated, as it is not important for them, and they might understate it.."

Highlighting the potential financial savings from waste reduction was the primary means that the project team could keep the firm motivated to continue participation in the project. Mr. Morelli explains: "The motivation is one thing. Basically, if you could show a company how they could save a lot of money, they might pay attention to it. If you start talking to them about improving the quality of environment, well, maybe that is sympathetic, but they really do not want to spend too much time on it, because that is not the business they are in; they are in the business producing whatever they produce."

From this analysis, students looked for several short-term waste reduction strategies to implement in the second phase of the project. Mr. Higgins describes the situation where a company implemented one of the recommendations and saved on costs: "Companies sometimes do not pay attention to the way they handle the waste. One company generated huge amount of paper, which they thought they were recycling. In the office, every employee had a box under the table to put the wasted paper for recycling. Later the paper was put to the recycle paper container. When the student went to look where the container was located, it turned out that the container was either full or missing, so all the paper went into the trash." The company

employees thought they were recycling the paper and getting paid for it, but a lot of it waste went to the container with trash.

In some situations, if an operation used mixed paper (color, white, newspaper), they were given recommendations to presort the paper and get more money for it. Some companies were given recommendations to look at the ways they receive the material, to change the way of handling packaging material, to keep cardboards from getting contaminated before they went back to the supplier. These small examples illustrate how company became aware of its waste problems, reduced the waste, and saved money.

Finance

The RITEWAYS$ was financed partially from State Fund and the rest came from private businesses. The description of the way the project was funded is complicated. To make it easy to follow, the project financing process will be described in two stages:

Stage I

Initially, funding came from the New York State Empire State Development' Environmental Investment Program. The brief description of the ESD will be found later in the paper. The EIP contributed $50,620 to the project, which

accounts for about 44% of the total project cost. This money covered the RIT co-op students' time spent in each company.[9] At the beginning, according to project summary, the EIP funding would include the payment for students only for a certain period of time, for 3-4 quarters. A quarter in RIT lasts for about 3 months, so the project funding would pay for approximately a year of students' work. At this point, there were only small financial contributions from the companies' side; they paid the first assessment fees. It was agreed to use this money for the project continuation, e.g. to pay students to work with companies for a longer period. Mr. Morelli describes the financing process: "Kodak sponsored couple of the co-op students. The whole idea was that if they paid at the beginning, we could get some students working with them, and we would generate money and that would support the next student so that can support next students, so on and so forth. And it went on for some time like that."

Stage II

As explained above, not all companies where the students analyzed facility operations and assessed solid waste management practices went further to actually implement the recommended practices. The RITEWAY$ students were to identify opportunities, but decision to implement the recommended actions to eliminate waste was left to clients (Rochester Institute of Technology, 1998). During the waste and process assessments the co-op

[9] Rochester Institute of Technology, Project Summary, April 1998 (included as an appendix)

students identified opportunities for reducing waste, and other savings from decreased disposal costs and raw material purchases. The problem was that it was too difficult to ask firms to pay based on potential savings. At the second stage of the project, if companies had decided to continue with the project, they had to pay for students' hours spent working at their facilities. Therefore, the RITEWAY$ began charging $525/week, for student services. The money collected from the second assessment fees was used to pay the student and contribute to the program. By the end of the project, it was calculated that $63,926 (56%) of the total project cost was paid by the participating companies.

Outcomes of the Project

Project Successes

A team of project supervisors had known each other before the project went into implementation. Team effort led to some successful project outcomes. James Gilbert, the Environmental Manager from Empire State Development, approved the application for the project so companies could get state grants and he monitored the financial part of the project. Mr. Higgins, as a professor, guided the students throughout the whole project implementation period. George Thomas, as a representative from Kodak, made sure that his company continued its involvement in the project.

Activeness, motivation and enthusiasm of the RIT student were essential throughout the project continuation. Eight students worked twelve quarters and

identified some noticeable savings opportunities at nine firms. Eight students participated instead of initially planned ten students because it was useful to keep experienced co-ops for two quarters to train new students. Co-op students identified opportunities for reducing waste, and related savings from decreased disposal costs and raw material purchases (RIT, 1998). The project supervisors, together with students, analyzed the process, gave recommendations, and took responsibility for the further project implementation.[10] The RITEWAYS$ project was not a long-term project but used several short-term strategies, which were identified during the project, lead to long-term savings.

Even if most of the companies did not follow with the implementation stage of the project, most of them got a picture of where the waste was going and how much it cost. "They would not be aware of waste issues if they were not involved in the project. Most people seem to appreciate that. They did not do much with it, but they seem to appreciate that," pointed out Mr. Thomas while talking about the overall project benefits. It was interesting to find out that the participating companies did not want to publish their outcomes. Mr. Morelli observes: "There were some waste related cost we have identified during the waste assessment period, but the companies would not let us publicize it because they did not want to look bad, like they have been wasting money. So that's one of the things you have to be concerned about."

Project Challenges

[10] Higgins, Tom. Personal interview, Rochester, NY, 22 December, 2003

There were several problems encountered during the project. First of all, most of the companies agreed to become a part of project because they personally knew the project supervisors. "I think, probably, we were able to convince people to participate in this study because they knew us. Otherwise I do not think they would even do it." observes Mr. Thomas.

Second, several problems with funding the project started to occur when the big companies began to cut back in their part of contribution to the project. As mentioned earlier, bigger companies, like Kodak, Xerox, already have environmental department and a person in charge of all the environmental issues associated with sensitive issues as hazardous waste, air emissions, water pollution and solid waste. Big companies found out that they simply do not need students' help any more.[11]

When some of the big companies ceased their further participation in the project, the RITEWAYS$ supervisors faced with another problem. They had to figure out how to occupy the students for a whole quarter (10 weeks). Small companies did not have big operations. Therefore, for a smaller companies, project supervisors had to put couple of the companies together for a given student. Only this way students could be kept busy and work for several companies within one school quarter. Sometimes one student worked four weeks per company.[12]

In addition to the fact that companies did not have enough work to get students busy for a quarter, they did not want to pay for a student for a quarter, because thier potential for reducing the cost was not significant. Therefore, some of

[11] Thomas, George. Personal interview, Rochester, NY, 12 January, 2004
[12] Higgins, Tom. Personal interview, Rochester, NY, 22 December, 2003

the small companies did not go further with implementation because the cost of dealing with waste was not enough to justify a lot of efforts.[13]

Overall Financial Retnrns

Eight students worked 12 quarters and identified $465,000 in estimated savings opportunities at nine firms. At the close of the one-year project, actual, measured savings came to $64,000. The RITEWAY$ earned $45,950 from its assistance efforts (RIT, 1998).

4.3.1. Analysis of Factors Influencing Project Participation

The RITEWAYS$ project did not continue as smoothly as it was described above; there were several problems associated with the project. First of all, most of the companies agreed to become a part of project because they personally knew the project supervisors, and could not disagree. "I think, probably, we were able to convince people to participate in this study because they knew us. Otherwise I do not think they would even do it. They might have done it just because we asked them to do it, together with RIT students," observes Mr. Thomas. Several problems originated with the project implementation. The problems with funding the project started to occur when the big companies began to cut back in their part of contribution to the project. Usually bigger companies, like Kodak, Xerox, already have environmental department and a person in charge of all the environmental issues associated with sensitive issues as hazardous waste, air emissions, water

[13] Higgins, Tom. Personal interview, Rochester, NY, 22 December, 2003

pollution and solid waste. Big companies soon found out that they do not need students' help any more.[14] Mr. Higgins adds: "Small companies do comply with regulations. Rules on air and water discharges apply to everybody. Bigger ones obviously have more rules to comply with. Kodak watches those things carefully because the value they deal with is so great. But, believe me, the rules apply to everybody. I worked as a consultant, I worked with small companies. As a matter of fact, they had hazardous issues, and they had to deal with it exactly the same way as Kodak did. If they break the rule the chances of getting caught is less because they would not get screwed as big company would, but the rules apply to everybody." Smaller companies ceased their project participation, because the project addressed solid waste issues only.

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[14] Thomas, George. Personal interview, Rochester, NY, 12 January, 2004
[15] Higgins, Tom. Personal interview, Rochester, NY, 22 December, 2003

the small companies did not go further with implementation, because the cost of dealing with waste was not enough to justify a lot of efforts.[16]

Why did some companies not agree to participate in the project?

There are several criteria which influenced the business decision to get involved in these projects. I will describe each criterion and, based on the importance of each criteria, I will prioritize them later in the conclusion.

1) Resistance

From the beginning of the project, after identifying potential companies to get involved in the project, it was hard to convince companies to participate.[17] "The trick was to convince somebody to do it. That was much more difficult that you would have thought. We offered an almost free service, almost free and in some cases it was free." expressed Mr. Thomas. There were more companies who disagreed to implement any sort of innovations; they were not ready for a change. "Only few of potentially selected companies agreed to become part of the project. We probably initially talked about and discussed 20 individual companies, and ended up with 4-5. We advertised our service, but not many were interested. The success

[16] Higgins, Tom. Personal interview, Rochester, NY, 22 December, 2003
[17] Higgins, Tom. Personal interview, Rochester, NY, 22 December, 2003

rate of getting someone to be interested in this free loan was very low. And that was disappointing part," said Mr. Thomas.

Mr. Morelli explains the companies' resistance: "Even if a project would not cost any money at all, and you say: 'we will provide this service for free,' it is not exactly free for them because they have to spend time with you; they have to have staff people work with you, and those people could work on doing some other things contributes to making money for the company. This was not going to make them much money; they did not see it as making them money." Companies also did not choose to participate because they felt that they didn't need any help to deal with their waste.[18]

2) External relations

External relations of the company play a big role in the implementation of P2 programs within the company infrastructure. Competition, market forces and environmental regulations were three major external factors companies considered while making the decision to get involved in the project. Companies were concerned about the environmental issues if they thought that being an environmentally good company was good for their business. Sometimes, if consumers are faced with two products at the same price: one from a company which has good environmental performance and another from a company with negative environmental performance, consumers rather buy from environmentally good company. Consumers'

[18] Higgins, Tom. Personal interview, Rochester, NY, 22 December, 2003

environmental awareness leaves small and medium size companies' in a tough position, because they are forced to look for alternatives and make their products more environmentally friendly.[19] Mr. Morelli explains: "The reason small companies are responding now is because big companies, for number of years, have been saying that while procuring services or products for their business they will give a preference to companies with outstanding environmental records. Big companies will give extra points in the procurement solicitation to a company that has the best environmental performance."

3) Cost and benefit

Most of the participating companies were driven by cost when they made a decision to participate in the project. They were not driven by environmental concerns or any other social responsibility concerns. The project was concentrating on non-hazardous solid waste only; it did not deal with chemical waste or hazardous waste, which usually implies regulations and higher costs. Unfortunately, costs associated with non-hazardous waste are usually low. The quantities of dollars relative to the amount of the kinds of materials involved were an important factor in companies' decision making process. "If we ask them to take the time to do this, without a huge benefit, they would probably refuse," stated Mr. Thomas. The cost of separating a waste stream, keeping an another separate container to handle all the other waste, takes extra works, and may only save a little bit of money. Companies'

[19] Morelli, John. Personal interview, Rochester, NY, 13 January, 2004

management thought they were better off if they just got rid of it all. A lot of people seemed not to care unless they had a requirement to do so.[20]

Some of the companies made their decision based on their budget. They had a budget for next year only. Even if change agents came up with good suggestions, companies did not have money at that point, and change agents had to leave recommendation to consider the proposal next year.[21] Mr. Higgins observes that it was not always easy to identify how much it will cost them to be part of the project: "For example, if you have an operation which uses mixed paper, you have an opportunity to presort the paper and get more money for it. Office paper is very valuable; prices on really good white paper are pretty high. Suppose the prices are low, and they get nothing for recycling it. But they do not have to pay for someone to come and take it away. Some places, we noticed, they could have separated colored paper, from white paper, and get more money for it. Sometimes there was a little trouble. We knew how much we are going to save but we did not know how much it is going to cost for a company to do it."

4) Priority and concerns

Environmental issues (in this case, waste reduction) was not on a priority for some companies' managers: "Companies struggle to get the business running; they have other more important issues to deal with and this kind of stuff is not on their radar screen. They look at all kinds of different things to keep the business in flow.

[20] Higgins, Tom. Personal interview, Rochester, NY, 22 December, 2003
[21] Morelli, John. Personal interview, Rochester, NY, 13 January, 2004

Minimizing the amount of solid waste they generate is just not at the top of their list," stressed Mr. Thomas. Mr. Morelli emphasizes the fact that environmental issue were not among companies' everyday concerns: "If you talk to them about saving money in the long term, like reduce liabilities and reduce insurance, they might listen, but they all seem to have more urgent matters. Everybody got to deal with making payroll; they got to deal with latest shipments, so it is hard to convince them that polluting less is good both economically and environmentally." People at the companies were not interested in participating in this project because these things did not cost as much to manage and there were environmentally acceptable solutions to solve these problems, to manage these sort of material.[22] He continued: "I do not thing people today are concerned about landfill. I do not sense there is much interest for whatever reasons. Mainly because land filling cost did not increase; on the contrary, they went down. But ten years ago they thought that land filling cost would continually go up. It was couple hundred dollars per ton to dispose waste. Now it is sixty dollars per ton.[23]" Mr. Morelli explains this criterion and brings an example: "If you are in charge of production line, you are making some product, and your environmental costs are just overhead. One worker is controlling one part of the production and his/her co-worker another part of the production. Meanwhile the company is paying an environmental cost, whatever it is: for lawyers, permits, or disposal. These workers are not aware of their own particular contribution to that

[22] Morelli, John. Personal interview, Rochester, NY, 13 January, 2004
[23] Higgins, Tom. Personal interview, Rochester, NY, 22 December, 2003

cost, so it is somebody else's. So if they are not aware of it; they are not going to be paying attention to it."

5) Amount of waste and type of waste

Companies that received a service were diverse in nature and size. Large, medium and small size businesses were included. For example, Kodak, Xerox, Wegmans, Kraft Foods, a drug operation, local hospitals and some other agreed to participate. The companies had to have enough waste problems within their facility, so the co-op students could get busy helping the companies for the whole quarter. "We went to Wegmans operations, and we did not find a whole lot of problems related to waste disposal there, because they already have done a lot," noted Mr. Higgins. In order to become a part of the RITEWAYS$ project companies had to have significant waste. A lot of times companies were not interested because their disposal costs were not very high. "When they look at all their cost and their disposal costs are not very big, they did not worry about it," said Mr. Thomas. The study only went after the stuff the companies throw into the waste basket or trash container. It was not about the chemical waste or hazardous waste that people would be more concerned about. "We specifically did not include it here," stressed Mr. Thomas.

6) Time

Timing also was an important factor, as it influenced small business' decision to participate in any kind of project. Some companies thought it was not worth their

trouble and their time to bother with. Mr. Thomas describes: "Even though we would almost reassure that if they gave the opportunity to go in there, we could show them how they could save more money than it would cost them to us the study. We offered the opportunity to save money, where they did not had to pay us. But for them it takes time to allow us to come in and do that, because they have to spend time with you, and they did not want to spend time for whatever reasons." The companies who got the most assistance under these programs, had to cover some of the expenses, but for the most part it was direct cash. Mr. Gilbert explains: "An employee who is on payroll devotes couple hours a week to this project. He/she would have gotten paid for this time anyway. It is a real thing because he could have been doing something else that makes the company money, so I would say it was in-kind."

8) A person from a company level

The decision to participate also depended on whom project supervisors approached at the company. Both Mr. Higgins and Mr. Thomas observed that if they addressed a person at the company who was responsible for environmental issues, they were less successful in convincing the company. They assumed that the person who is in charge of environmental issues would be more interested in the project, because they know more about pollution problems associated with company operations. But it was opposite of their assumptions. In many cases, if a company agrees to get involved in any project related to an environmental problems, then the

person within the company who is in charge of working with these problems is not performing correctly.

9) A change agent

The way change agent fulfills his responsibilities played major role under their responsibility. They had to be experienced in their field and had to be able to convince companies to participate in the project. Mr. Morelli discusses: "I think everybody tries to avoid any more work. You need to be able to sell it. You need to catch their attention and make them spend two minutes to hear you and in that two minutes you have to tell them something that's going to make them spend more time."

When a new person who was not a company employee walked into a company, someone at the company had to assist him: guide him through internal operations, walk around the plant, and answer questions. Company manager had to dedicate his employee (employees) to work with the project and that took time. There were assumptions that that employee could be more efficient to the company, if he did his own job, not related to project. There were a lot of issues associated with that.[24] Mr. Gilbert observes the project failure: "A problem with the RITEWAYS$ project was that once the experts came in, did their work, installed whatever it was and walked away, project kind of stopped. This supposed to be somewhat continues bases, and provide benefits. I am not sure what we have achieved."

4.4. CASE STUDY 2 - Business Waste Reduction Project

High Technology of Rochester Business Waste Reduction Project (1999-2001)

Case study 2 is the study of the Business Waste Reduction Project which was conducted by High Technology of Rochester (HTR). The Business Waste Reduction Project was funded by Empire State Development's Environmental Management Investment Group, which provides assistance to companies in the Finger Lakes region.

Under the Business Waste Reduction Project, HTR helped smaller manufacturing firms identify opportunities for increasing productivity and competitiveness. The project lasted over two years, with the completion date in March, 2001. HTR provided waste and process assessments, and when feasible, helped companies to implement strategies to address problems in production processes that were causing inefficient use of resources and related productivity losses.[25] The project was not about compliance with regulations and laws; it was about helping companies voluntarily go beyond the compliance, which would be profitable for the business in the long run.

Dick Krause, a project manager in HTR, with over 40 years of manufacturing experience, played one of the major roles in this project. He has helped manufacturing companies collectively and individually assess the reliability and effectiveness of their production equipment and processes.

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[24] Thomas, George. Personal interview, Rochester, NY, 12 January, 2004

Project expectations

The goal of the Business Waste Reduction Project was to provide a technical assistance on waste prevention and recycling to at least eight manufacturing firms in the Finger Lakes region. The funds from Environmental Investment Program were to be used to help offset the cost of performing waste and process evaluations, and for implementing strategies to address problems in production processes causing inefficient use of resources and reduced productivity. Combined, over a two-year period these efforts were to yield at least $240,000 in savings for participating companies.[26]

Selection of Companies

High Technology of Rochester used different techniques in the selection process for the companies to participate in the Business Waste Reduction Project. In general, High Tech of Rochester works with small and medium-size manufactures. In some cases companies approached the organization by themselves. In other cases, the HTR looked for companies that had significant waste and pollution problems. There were many companies that the HTR was already familiar with and knew that waste was one of their problems. There were also quick assessments which came

[25] High Technology of Rochester, Project Summary, March 2001 (included as an appendix)
[26] Krause, Richard. Final Report for EMIG Contract # C003319. March 10, 2001.

from visits to companies for other reasons that gave HTR experts a clue as to whether waste was a problem.[27]

There are 1700 companies in the Finger Lakes region that are in the database of HTR. Having company names available in their database helped HTR identify companies that had significant waste and pollution problems. Environmental Manager from Empire State Development, James Gilbert, played in important role in the project; he was a Project Manager. He notes: "That's one of the reasons we worked with HTR. Because they already know most of the companies in the regions; they have established relationships. Companies know what HTR is and what they are doing. It is HTR's business already to know these companies. So it was relatively easy for them with their database and contacts."[28] The Environmental Services Unit reviewed the project that was presented to them by High Technology of Rochester. In particular, Mr. Gilbert reviewed the proposal and prepared the project material to get it approved by senior management. After a contract was developed and done, he oversaw its submission. HTR was required to report to the ESU on a regular basis about their activities and their accomplishments during the given time period.[29]

Finance

The budget for the project came both from the New York State Environmental Investment Program (NYS EIP) and participating companies. All companies had received 50% of the project cost through the NYS/ESU. Some projects were larger than others, but the company match and the assistance from the

[27] Krause, Richard. Email correspondence. February 12, 2004

NYS-ESU was always the same percent. When a company agreed to participate in HTR Waste Reduction Project it also usually agreed to pay their part of the total sum, depending on the size of the project. HTR would invoice the company for their 50% as work was completed. HTR would also then bill the NYS/ESU for the other 50%. The in-kind cost from each project varied depending how much company employees were used.[30]

The total project cost was $157,728. The EIP covered $64,308, which accounts for about 41% of the total project cost, and the companies paid $93,420, which accounts for 59% of the total cost (HTR, Project Summary, 2001). Some companies paid for the HTR's services; several of them received financial assistance applying for and obtaining funds from the Empire State Development's Industrial Effectiveness Program (IEP).

Sometimes it made financial sense for companies to implement P2 practices immediately and not wait for financial assistance, e.g. the costs and benefits were clearly calculated, and they would get their payback in a short amount of time. Explained Dick Krause: "You do not want to wait to get financial assistance. When a company applies for financial assistance, sometimes it takes a year to get an approval."[31] Plus, the application process itself is a long procedure and it takes time. Everything has to be documented in papers, and then submitted for the consideration of the funding agency. In some instances, the HTR clearly could see enough payback

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[28] Gilbert, James. Personal interview, Rochester, NY, 5 January, 2004
[29] Gilbert, James. Personal interview, Rochester, NY, 5 January, 2004
[30] Krause, Richard. Email correspondence. February 12, 2004
[31] Krause, Richard. Personal interview, Rochester, NY, 4 December, 2003.

and convince the company not to apply for financial assistance, but take voluntary initiative by themselves.

Approach

The approach that HTR took was based on convincing companies that it was in their best financial interest to implement the pollution prevention practices. "As opposed to saying: 'The law says you got to do this, the law says you got to do that,' the companies can still be within the literal law and still conduct wasteful, environmentally unfriendly practices." emphasized Mr. Krause.[32] He outlines several steps in the procedure of approaching a company. Table 1 shows five steps included to the process:

Table 1. Procedure of approaching the company. [33]

Step #	Process description
Step 1.	Contact a company that might have a waste problem and ask for an interview.
Step 2.	Determine approximate dollar cost of waste and the general sources of the waste.
Step 3.	Get company's approval to do a Value Stream Mapping of waste stream with a team of company employees that were knowledgeable of problems.
Step 4.	Write a proposal to use a team approach to reduce waste.
Step 5.	Once company approved contract proposal, HTR worked with a company team to use LEAN tools to reduce waste.

[32] Krause, Richard. Personal interview, Rochester, NY, 4 December, 2003.

Overall, their approach was to look at total operations and find a way to convince the company that is in their best interest to improve reducing waste and improve the environmental situation from a financial point of view. Mr. Gilbert explains, this mean going beyond compliance: "Everybody has to comply. They have to be in compliance. We are taking them beyond the compliance. For example, if a company is at the limits of their compliance for air pollution and they want to expand, they have to either install air pollution control device or they have to find some other way of doing business. We were saying that maybe there was another way doing their business; maybe you can go to low VOC material and reduce their emissions, so that they can expand. This was the type of thing we were looking for."[34]

Project Description

Experts and analysts employed or contracted by HTR, while working for other organizations, conducted field tours of the companies. While looking for waste reduction opportunities they looked at a global picture of companies' processes and activities. The main questions to address were:

- what creates waste?
- is the set up correct?
- what can you do to reduce the waste?
- where can the production costs be saved?

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[33] Krause, Richard. Email correspondence. February 12, 2004.
[34] Gilbert, James. Personal interview, Rochester, NY, 5 January, 2004

This whole approach is called the LEAN techniques. Wayne S. Chaneski (2001), who is Industrial Projects Manager of the Center for Manufacturing Systems, New Jersey Institute of Technology, gives a brief explanation what the LEAN means: "The true meaning of lean manufacturing is the elimination of waste in the process. A lean manufacturing process is one that continuously strives to eliminate waste, thereby increasing the percentage of time devoted to value-adding activities. The more value you can add in your overall process, the more effective your operation will be. As long as you focus your efforts on waste elimination, you are on your way."

High Technology of Rochester approached companies with a LEAN technique, which is called Value Stream Map. Once they generated a value stream map, they could clearly show companies where problems were occurring. It did not mean the companies had to change their whole operation, but often implied doing literally hundreds of small improvements: getting operators trained to do their part of work correctly, changing set ups to be less wastefull, etc. Once in a while they found a major waste where thousands dollars could be saved, but it was very rare.[35] Most of the process involved looking over and over again and making continuous improvements.[36] As explained by Mr. Krause, "You take the global picture of the whole process, the whole value stream, and you start identifying where dollars can be saved, and then you start implementing those identified measures to save dollars. And in the process you improving the environment and reducing waste. It is a very

[35] Krause, Richard. Personal interview, Rochester, NY, 4 December, 2003
[36] Krause, Richard. Personal interview, Rochester, NY, 4 December, 2003

logical approach when companies are improving their process by reducing their cost and at the same time reducing the pollution and the waste stream."

He continues with an example of identifying the hidden cost on the process of making punch press: "You see the tool coming in and the tool coming out. But you have to get behind it. You got to look at electricity used, any cooling valve, any oil residues come from there, a set up which is wasting time, materials, and you start getting all those little things that did not added up to dollars. Then you can convince the company and tell them that if they cut up this set up by 50% they will cut all the direct and indirect costs, they will save some money."[37] As discussed earlier, the procedure of identifying hidden costs is a Value Stream Mapping. HTR met the success when managers understood that decision to follow up with Value Stream Mapping was profitable and convenient for their future operations, and agreed to participate in the projects.

Essentially, what HTR's experts and analyst did was approach a company, do an assessment by looking around what the product issues were, and offer a view whether there is a significant opportunity to help them reduce waste and improve environmental conditions. If they thought that there were some, then it was a matter of spending a little more time doing a quick Value Stream Map by describing step by step through the whole process and trying to at least estimate how much waste there was, and from that they could give a company a proposal. And when they got a proposal on table, depending how attractive it looks, some companies would agree to do the things given in the proposal. "Even if they do not find the proposal attractive

at that particular time, most of them will eventually come back for this opportunity, because for them it is opportunity to reduce cost," said Mr. Krause. [38]

Outcomes of the project

By implementing value stream mapping tools, HTR helped the companies to eliminate processes that add no value to the operation. When the companies improved manufacturing processes, they were saving more than direct material cost or direct labor cost. HTR's experts revealed all the costs of company operations to the managers, stressing the importance of hidden cost - costs which were are not shown in company's papers on internal finance records.[39] During the two years of project continuation, eighteen waste assessments, sixteen process assessments, and eight implementation projects were completed. Several of the companies required more detailed analyses to determine exactly how to proceed. Theses companies received assistance applying for and obtaining funds from the Empire State Development's Industrial Effectiveness Program. Four participating companies discovered that they needed to implement strategies that went beyond the scope of the HTR program. These companies applied for additional funding through the Environmental Investment Program. Mr. Krause brought an example: "One large company received a small grant from the EIP, and this was a small amount of money, just to give an assessment. When we walked into the company's facility there was such a huge potential in savings. Then we looked for different kinds of

[37] Krause, Richard. Personal interview, Rochester, NY, 4 December, 2003.
[38] Krause, Richard. Personal interview, Rochester, NY, 4 December, 2003.

grants, which they did receive later and in company documents it is estimated that through that grant they saved millions of dollars."[40]

Two of the companies who participated in the projects, subsequently received awards and are moving forward with implementation.

A critical benefit of the project was being able to tie the impact of process waste to the overall productivity and profitability of individual firms. This has proven to be a very effective way to get management to invest in activities that reduce waste and environmental problems while improving the business' bottom line (Krause, 2001).

Financial returns

Over a two-year period these efforts were to yield at least $240,000 in savings for participating companies. Combined, the results of these efforts actually led to savings totaling over $405,000/year. In addition, another $208,000 in potential savings were outlined, and are expected to be implemented (High Tech of Rochester, 2001).

High Technology of Rochester submitted Project Status Report to the ESD. Table 2 shows the number of participated companies and the stage at which they ceased their project involvement.[41] The names of the companies are to be kept confidential.

Table 2. Outcomes of the Business Waste Reduction Project

[39] Krause, Richard. Email correspondence. February 12, 2004.
[40] Krause, Richard. Personal interview, Rochester, NY, 4 December, 2003.
[41] Krause, Richard. Final Report for EMIG Contract # C003319. March 10, 2001. page 1.

Company #	Waste Assessment	Process Assessment	Implementation	Savings
1	Complete	Complete	Complete	$60,000
2	Complete	Complete	Complete	$12,000
3	Complete	Complete	IEP	------
4	Complete	Complete	Complete	$50,000
5	Complete	Complete	IEP	-------
6	Cancel			--------
7	Complete	Complete	Re-visit	---------
8	Complete	Complete	Complete	Company decided not to pursue
9	Complete	Complete	Complete	Received EIP award
10	Complete	Complete	Complete	$7,000
11	On hold			---------
12	Complete	Complete	Complete	$21,000
13	Complete	Pursmg NYSERDA		---------
14	Cancel			----------
15	Complete	Complete	Complete	$90,000
16	Hold	Hold		---------
17	Complete	Complete		---------
18	Complete	Complete		----------
19	Complete	Stopped		----------
20	Complete	Complete	IEP	----------
21	Complete	Complete	Received EIP Award	----------
22	Complete	Complete	Complete	0
23	Complete	Complete	Complete	$115,000
24	Complete	Complete	Complete	$50,000
25	Complete	Complete	Assistance with EIP Application	Estimated $200,000
26	Complete	Complete	Assistance with EIP Application	Estimated at $80,000
27	Complete	Complete	Assistance with EIP Application	Estimated
Totals without	18	16	8	$405,000

The project goals and accomplishments are summarized in table 3 below:

Table 3. Project goals and accomplishments.

Milestone	Goal	Actual
Cost reduction savings (annual savings)	$240,000	$405,000
Waste assessments	12	18
Process assessments	10	16

Improvement projects completed	8	8

4.4.1. Analysis of the Business Waste Reduction Project outcomes

Why did some companies not continue their participation in the project?

There were other factors that have influenced the managers' decision to follow up with the process assessment and implementation. Table 2 shows that out of 27 companies addressed: 23 did waste assessment, 21 had process assessment, and 14 implemented the recommended actions. Several companies had gone through management changes, acquisitions and market problems that have prevented them from implementing improvements. Within some companies, a waste reduction project was not implemented due to lack of sufficient savings opportunity. In one company waste reduction project had a marginal payback and general manager was on a tight budget and did not want to attack some of the productivity problems at the time (Krause, 2001).

Why did some companies refuse to participate in the project?

There were several companies that refused to participate in the Business Waste Reduction Project. Some of them refused before the waste assessment was made, some after. The major reasons for their inactiveness were lack of resources, lack of time, or there was not enough pay back. While explaining why some

companies refused to participate in the project Mr. Krause said: "In economic times, companies are under severe pressure, and many times there is not enough savings identified to put that on the top of the list. There are also a lot of companies, facing bad economic times. Small and medium sized companies, where we are concentrating, are going through ownership changes, management changes, and there is no way to get their attention."[42]

There are several criteria which influenced the business decision to get involved in this project. I will describe each criterion.

1) Cost and benefit

Under this project, most of the participating companies were driven by cost while making decision to participate in the project or not. They had to know what their payback period was, e.g. how long it will take to get returns on the investment they made to participate in the project. Mr. Gilbert explains: "They put a certain amount of money into it and see if they can save that money within a year. That's typically what companies are looking for, a payback of a very short period. Sometimes it is few months when company wants to see a payback, particularly if they are facing times when it is hard to get capital. Other times they are willing to wait for two years to get a payback. It all depends on a variety of different factors. You never really know what aspect of a company motivates them."[43]

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[42] Krause, Richard. Personal interview, Rochester, NY, 4 December, 2003.
[43] Gilbert, James. Personal interview, Rochester, NY, 5 January, 2004

2) Amount of waste and type of waste

For some of the companies that refused to get active in the project, the potential for cost savings was not there; they did not have too much waste coming out their facilities. HTR did not go further with the company if potential for waste reduction was not there.

The type of waste also influenced who they worked with in the company. This, in turn, influenced the degree of attention the issue got. For example, if you are going to a company and just talk about the direct things, such as the landfill costs, most people at the company will say: "Go see a maintenance manager; it is his job to deal with these issues." But if you can tell them that between the landfill cost, the lost material, the lost capacity, and the lost set-up time, the lost material handling, the lost water, the lost electricity; if you add all those up, and you get a high enough number, they can not ignore the opportunity, because they can save money by fixing these problems. If the HTR experts went to the company to identify the waste problems, and saw that the biggest problem was in energy, then it was up to a person in the company who deals with energy issues. "Everybody is under the gun, so they have to get the priority things done first, and a lot of the smaller stuff either have to be dealt or goes off the table," said Mr. Krause.[44] If HTR got enough potential savings identified, then they got manager's attention. Managers could not ignore it.

3) Priority and concerns

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[44] Krause, Richard. Personal interview, Rochester, NY, 4 December, 2003.

In some instances companies' management thought that they should be concentrating on some other issues such as competition, market problems, customer satisfaction, re-organization, organizational changes, acquisitions, management changes, new owners or additional sales. Waste issues were not in their priority list.[45]

Mr. Gilbert notices that environmental issues were not a priority concern for some business managers: "The companies only have so much time; they only have so many resources to devote to the various aspects of their business. When deciding how to allocate it they do not have many choices and Pollution Prevention is not in their list. First of all they do not know anything about it, they are not familiar with it, and they may think it is hard, versus, many things they have been suggested is really easy."[46]

4) Team Effort

A good implementation of the Value Stream Map requires team efforts. The LEAN technique also assumes team effort; getting everybody in organization to look at the process, and their portion of the process, and find steps in the process where you can make a small improvements. Wayne S. Chaneski describes: "One of the first things you notice when completing a value stream map of your current operation is how eye-opening an experience this can be, especially if you complete the map with a cross-functional team of people from the organization (which is the best way to go

[45] Krause, Richard. Email correspondence. February 12, 2004.
[46] Gilbert, James. Personal interview, Rochester, NY, 5 January, 2004

about this effort). It is amazing how things that many of us think are common knowledge are complete revelations to others. So the first benefit of the process is creating a common understanding of just how and when things occur" (Chaneski, 2001). For some of the companies included in Business Waste Reduction projects, it was a tremendous team oriented effort. Teams were selected by both company management and HTR on the basis of who was most knowledgeable at the operations level and who was available.[47] Mr. Krause noted on the effectives of team effort: "When you get people that are doing work energized and creative, they end up with hundred things that need to be done to improve the process and reduce waste."[48]

4.5. CASE STUDY 3 - Business Waste Reduction Project

Case study 3 is the study of the Business Waste Reduction Project, which was conducted by High Technology of Rochester also.

High Technology of Rochester Business Waste Reduction Project (2001-2003)

This project was built and expanded on a prior technical assistance program HTR conducted. It also assumed that HTR had more experience in the field of working with small and medium sized companies. The project lasted over two years, with the completion date in September, 2003.

Selection of companies

[47] Krause, Richard. Email correspondence, February 12th, 2003.
[48] Krause, Richard. Personal interview, Rochester, NY, 4 December, 2003.

The selection process for the Business Waste Reduction Project High Technology of Rochester was the same as for their previous projects, which is described in the Case study 2. Again, in some cases companies approached the organization by themselves. In other cases the HTR looked for companies who had significant waste and pollution problems. Forty-one companies to target were selected from a review of the HTR's client database and other sources.

The CMS Consulting Group was a consulting company for one of the large companies that participated in this project. The President of CMS Consulting Group, Anthony Carlisi, explains how they were involved in the selection procedure: "We are aware of a lot of state, federal and local grants available to a company. When we have a client that is able to take advantage of these funds and benefit from them, we make the company aware and they complete the applications. We may or may not do the project with them but we still feel that it is our obligation to make them aware that there is some funding available." Business Waste Reduction project was a typical project for CMS and they teamed with High Technology of Rochester on this project.[49] Carlisi continues: "The company we worked with under this project was already a client of ours; we have done another project with them before and we knew they had a lot of process waste. While working with the company, we estimated the cost of waste stream. We were aware through HTR that there was a program that provides funding [for waste reduction projects]. So that's how the match came

[49] Carlisi, Anthony. Personal interview, Rochester, NY, 10 February, 2004.

together. The actual applicant for State funds has to be a non-profit organization and HTR is. They were the official applicants for the funding."[50]

Finance

Before participating, each company had to be convinced that they are getting value. Therefore, the initial discussions were totally free of charge. Mr. Gilbert explained: "That part was totally free to the company. We call it marketing." Project supervisors went to 41 different companies, at which time they received a general impression of each company. In order to find out whether getting involved in this project would benefit the company, consultants together with companies' managers made "back of the envelope" calculations of the costs and benefit. While estimating the cost of the program for each individual company, the following was taken into account:

- the cost of consultants;
- the labor costs of employees involved in the project;
- nature of waste and costs associated with it.[51]

The budget for the project came both from the New York State Environmental Investment Program (NYS EIP) and participating companies. The total project cost was $202,216. The EIP covered $88,583, which accounts for about 44% of the total project cost, and the companies paid $113,633, which accounts for 56% of the total

[50] Carlisi, Anthony. Personal interview, Rochester, NY, 10 February, 2004.
[51] Fink, Mark. Personal interview, Rochester, NY, 10 February, 2004.

cost.[52] Some companies paid for the HTR's services. Several of them received financial assistance applying for and obtaining funds from the Empire State Development's Industrial Effectiveness Program (IEP). These number show that the some companies were able to cover part of the expenses of the project. Money for the project paid by the companies covered more than half of the total project cost.

Approach

As the HTR already had a good experience in making an appropriate approach to the companies. This time they were more successful in convincing the companies to participate in the project. This time the HTR experts and analysts conducted site visits to each facility. The visits included the preliminary assessments of environmental opportunities. As just discussed, these initial visits were free of charge. Mr. Carlisi explained: "We do sometimes what we call pro bono work, which is work we do without charge for nonprofit organizations. We have a policy that until we actually sign a contract to do the work there is no charge. In order to write the proposal we have to spend 10 man-days with a company to understand what their problems are; there is no charge for that. They need some of the skills of our people for a few days and we provide that without a charge. We consider that as a part of our social obligations. A firm only pays after we sign a contract."

The project supervisors focused on Pollution Prevention as a money maker for the company, or money saver. "Companies are there to run business and to make money, they are not there to comply with regulations," said Mr. Gilbert. Mr. Carlisi explains the purpose of the project in the following statement: "The purpose of this

[52] High Technology of Rochester. Project Summary, September 2003

program was not just to save the company money; it was to reduce the waste stream going to landfill. Everything that comes out of machine that is not usable in product has to be scrapped to a landfill. And what we wanted to do is reduce the amount of waste going to a landfill."

Project description

Project supervisors started the process by outlining the nature of each company. While making the calculations of the potential savings, such issues were carefully considered as company size, how much of raw (input) material was used, how much product was manufactured, sales, distribution of products, and number of employees, wage of employees, etc.[53] Then, companies had to write an application for the grant. The Process Development Manager at Reckitt Beckiser Inc.'s Wolcott plant (one of the participating plants), Mark Fink, explained: "It was a couple of page application. It was not a tremendous amount of information; it was a very straightforward process," When writing the application, it is important to show that the company will succeed in the waste reduction effort. For obvious reasons, the funding agencies do not want to give money to a company which is about to fail. So applicants need to provide the government with the basic information about the company to convince them that we were the company that would be able to use the resources of the fund.

The next step was to gather specific information about each company. This was done in order to make sure that there was an opportunity for waste reduction and

[53] Fink, Mark. Personal interview, Rochester, NY, 10 February, 2004.

there was some opportunity for the fund to have a profitable impact.[54] LEAN manufacturing principles and training were discussed with the company representatives. For the nine companies receiving full assessments, once a contract was in place, the HTR and company personnel created a "Value Stream Map," as was discussed earlier in the paper, to help identify sources of waste and possible strategies to reduce the waste.[55] LEAN manufacturing is what really drove the identification of waste reduction because the whole concept of LEAN is to eliminate waste; eliminate not only material waste (scrap), but also waste of time, the excess production, the excess inventory; all kinds of waste. What this program did was that it emphasized that by proposing LEAN approaches not only it would make companies more efficient but they would improve the environmental impact by reducing the materials going to the waste stream. The companies implemented all kinds of LEAN techniques that allowed them to reduce waste, whether it would be material waste or other forms of LEAN manufacturing waste.[56]

There were several major objectives of the projects:

- to reduce the amount of the waste stream going to the landfill;
- to provide employees with skills via training;
- to improve the process and make it more efficient;
- to save the companies money. [57]

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[54] Fink, Mark. Personal interview, Rochester, NY, 10 February, 2004.
[55] High Technology of Rochester. Project Summary, September 2003 (included as an appendix)
[56] Fink, Mark. Personal interview, Rochester, NY, 10 February, 2004.
[57] Carlisi, A. Fink, M. Personal interview, Rochester, NY, 10 February, 2004.

Mr. Fink explains the purpose of these objectives in the following manner: "A company wants to not only be able to reduce the material scrap; but also to be able actually understand the processes that allowed the waste reduction. Concurrent with that was developing improved productivity: if we were handling materials better, we were able to use them more efficiently, and we were more productive. So we wanted to become more effective as a company."

The project supervisors arranged site visits to each facility to assess management style, attitude toward waste prevention, and financial status. They were responsible for technical aspects of the program: identifying what potential savings were, identifying and implementing process changes. The process of the project included putting new procedures and training in place so that the companies could have the increased productivity. More of what was produced was usable as product therefore less was scrap.

Outcomes of the Project

Implementation of recommended actions led companies to protect the environment and save the production costs. Savings did not come from one major source of the companies' operational processes, but from many little improvements. The project supervisors helped companies to reduce the amount of scrap generated at the companies' facilities. For example, at one participating company, Schlegel Systems, one of the waste reducing opportunities was to bale the waste and then try to compress it as much as possible. It still weighed the same, but took less space in

the landfill. Schlegel Systems also improved their recycling process by keeping the corrugated paper (cardboard boxes) clean, not contaminated.[58] The Process Development Manager at the Wolcott Plant observed that many times the cost of the grant was returned both in terms of improved efficiency and productivity, and also in material that was not going into the waste stream. After the implementation of the recommended strategies at the Wolcott Plant, there was a large volume of material that was not going to the waste stream.[59]

The companies saw savings from:

- reduction of material scrap;
- reduction of landfill charges;
- reduction of corrugated, that went to recycling or was re-used;
- reduction of transportation costs.[60]

The company savings were not always directly related to the waste stream. By using Value Stream Mapping techniques, employees of the Wolcott Plant revealed hidden costs. The company employees had determined that they could actually put another layer of the product on the top of the pallet, and it would still fit in the truck. They put another layer of product and set cases on the top of the pallet. This process helped to use trucks more efficiently. The company could get the same amount of the product to the market in fewer trucks. Because they could fit more products in each truck they had lowered the transportation and labor costs. The Wolcott Plant employees would not have know about these potential saving

[58] Carlisi, Anthony. Personal interview, Rochester, NY, 10 February, 2004
[59] Fink, Mark. Personal interview, Rochester, NY, 10 February, 2004.

opportunities without being involved in the Business Waste Reduction Project.[61] Overall project estimates show that in this plant manufacturing waste reduced included 434 tons of fabric, plastic and organics. That led to the reduction of disposal costs. Savings beyond original estimates were achieved as a result of the dedication and creativity of each project team. The HTR's program verified that environmental improvements and waste reduction had been achieved by looking at entire processes and leveraging new savings from indirect (non-material) areas. The LEAN tools and teams were also key ingredients (HTR, 2003).

Overall, nine companies saved on raw material and waste management costs, and in indirect savings. Another thirty-two companies became aware of waste reduction and pollution prevention possibilities and the LEAN approach as a result of this project. In September 2003 the project was theoretically completed. But LEAN (Value Stream Mapping) is supposed to be a continuing process for the company, where they company continues to improve its operations.[62] Reckitt and Benckiser Inc. started using VSM even beyond its facility at Wolcott Plant; they are using it in other facilities of company now. Because the employees were trained on VSM and because the management saw the impact it had, the managers are making sure that they continue to implement VSM techniques.[63]

Even if these thirty-two companies did not go further with implementation, they at least became aware of the environmental issues at their facility. Maybe companies

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[60] Fink, Mark. Personal interview, Rochester, NY, 10 February, 2004.
[61] Fink, Mark. Personal interview, Rochester, NY, 10 February, 2004.
[62] Gilbert, James. Personal interview, Rochester, NY, 5 January, 2004
[63] Fink, Mark. Personal interview, Rochester, NY, 10 February, 2004.

will decide to follow up the implementation of the waste reduction opportunities later on.

Financial returns

> The results achieved were impressive, and it exceeded expectations. Nine companies saved $712,000 on raw material and waste management costs, and $512,000 in indirect savings. Plus, there is the potential for over $1.5 million in additional savings from continued activities. [64]

4.5.1. Analysis of the Business Waste Reduction Project outcomes

Why was the project successful?

There are two factors that contributed to the successful continuation of Business Waste Reduction Project: team effort and training of companies' employees.

Team Effort

The major difference of two projects conducted by the HTR is that during the second project implementation, more emphasis was stressed to the importance of team building and management involvement. "Cross-functional teams were set up at each facility to assure implementation of recommended actions. The most successful projects were those with support from the top down."[65] Sharing ideas with other co-workers at the company, learning from others' experience, and creating common

[64] High Technology of Rochester, Project Summary, September, 2003 (included as an appendix)
[65] High Technology of Rochester, Project Summary, September, 2003 (included as an appendix)

understanding were essential during this project.[66] Mr. Carlisi describes how the team was formed at Schlegel in the following statement: "The key for us with Schlegel was that we had a very good supervisor in the area. He put together an excellent core team, which was the team that actually was going to do the work. Plus, they were very committed to make improvements. In LEAN there are a lot of elements and one of them is Standard Work. Standard Work is essentially insuring that everybody is using the best practices for their job. We wrote up the job descriptions and procedures based on the best practices and trained the entire group so that they were using the best practices."

At the Wolcott Plant, the managers and employees were committed to fulfill the project requirements. Mr. Fink explains: "We wanted to do this project so we paid money that needed to match the grant. We have allocated the time for the people to do the things associated with the project and we gave additional resources as the company needed to implement some of the changes." Once the company management and employees offered that level of commitment, a specific series of teams were created from each of the product areas. The teams were cross-functional teams that included staff from the management, logistics, the actual operators who ran the equipment and others that were involved in the project. The team began the study to identify where the waste was. Then the team continued to identify the opportunities for improvements and suggest additional projects.[67] "What made the project particularly successful was that it did not stop with this grant after the year or

[66] High Technology of Rochester, Project Summary, September, 2003 (included as an appendix)
[67] Fink, Mark. Personal interview, Rochester, NY, 10 February, 2004.

so. The team went back and looked at it again and again because they have developed the techniques," added Mr. Fink.

Training of companies' employees

Value Stream Mapping helped to reveal several steps in the process that had to be changed. Mr. Carlisi emphasizes that training of work force was an essential process in this project: "One of VSM techniques we used implied training of the work force. There have been a lot of changes and people who were running the process were less experienced. They had to learn to tune the process so it is making good products. We put together the training package and worked with the company to train the work force on the certain equipments, so they were able to make good products sooner."

One of the key elements of this particular approach was its focus on having the individual operator, the employee, do a lot of the serious thinking about what could he/she do to make the system better. The state grant was used to train the employees and provide them with the necessary skills. The companies were able to uplift their workforce in terms of their ability to help make the process improvement on a continuous basis.[68]

Why did some companies not continue their participation in the project?

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[68] Fink, Mark. Personal interview, Rochester, NY, 10 February, 2004.

As well as projects described in Case study 1 and Case study 2, this project had some weaknesses also. Of 41 companies contacted, only nine completed a project. Eight of the remaining companies did not have a major opportunity to reduce waste. Five have contracts still waiting for a start date (and therefore did not receive funding from this grant) and the balance of companies had management issues that prevented going forward with a project even though the estimated payback was significant. The reasons included more important projects, organizational or ownership changes, too busy at this time, or unstructured decision process. There is a good possibility that these companies will go forward at some time with a waste reduction program out of necessitate to stay competitive.[69]

Why did some companies refuse to participate?

The reasons why some companies refused from participating in the Business Waste Reduction Project are basically the same as described in Case 2 section of this paper. Some of them refused before the waste assessment was made, some after. The cost of the project was the primary factor for the companies' management to make up their decision to get involved in this project.

Most of the companies which participated in this project wanted to be good citizens. They wanted to improve the environment if they could.[70] But again, similar to the projects described in Case 1 and Case 2, most of the companies were driven by cost, e.g. how much it would cost them to implement the recommendations and what

[69] Krause, Richard. Final Report. Waste Reduction in Finger Lakes Region. September, 2003.
[70] Carlisi, Anthony. Personal interview, Rochester, NY, 10 February, 2004

would the financial returns be. Mr. Fink describes how the cost was taken into account during the decision making process at the company he worked for: "It was clear that our company was cost-driven. We had to have money to do the project. There are two reasons that I would say in general would motivate the companies to do things like that: 1) the government requires them to do it; 2) they can make money or save money by doing it. Obviously, from the business perspective it would be much nicer to reduce costs by doing something. But if government tells you have to do it, you do not have a choice, you do it anyways. So clearly, the company needs money." Mr. Carlisi also notices the cost as a driving factor: "The point is that a lot of companies have to live here too; their people have to live in the same environment as we do. That is why they do not want to be doing nasty things to the environment. However, if they can at least break even on a project like this most companies will participate in the project. If it costs them three times the amount that they are going to save and it is not a major impact on the environment they will not do it. If they can see that by improving the environment they break even on the cost, I think most of the companies will do it."

The participating companies, however, understand that the purpose of the state grant is to reduce environmental waste. Mr. Fink explains the motivation of his company to use the grant: "If we had a project that would only improve efficiency and did not reduce waste stream we would not got funded. Our project had both kinds of savings. It was clearly beneficial to the company because we saved money. Plus, we were able to produce processes that were more efficient. It was also

beneficial to the state, because not only the company strengthened its overall position, but also their flow to waste stream was significantly reduced."

In some cases, even if the companies had known that the project could save them money, they did not have enough financial or human capital to do it at the first place. Not all the projects assumed the big monetary contribution of the company, but some investments of their employees time or other resources.[71] Small companies in particular are always struggling with lack of such resources as money, labor, and time.

For some of the companies, small environmental problems were not of a priority issue. They thought it might be too hard for them, or they did not want to devote resources to it. They were concentrating on other aspect of their business (cut back in the number of employees, merger, increase in sales) and did not want to do any sort of Pollution Prevention activities.[72]

It was up to the managers to decide whether the company should follow up with the project. Mr. Fink noted: "In order to be even remotely successful there have to be support by the management. If management is not committed making the project work, it won't work, because the people (employees, operators) would not do it without managers telling them to do it."

Other reasons why some companies refused from participating in the Business Waste Reduction Project are basically the same as described in Case 2

[71] Fink, Mark. Personal interview, Rochester, NY, 10 February, 2004.
[72] Gilbert, James. Personal interview, Rochester, NY, 5 January, 2004

section of this paper. Some of them refused before the waste assessment was made, some after. The reasons for their inactiveness were:

- lack of resources;
- lack of time;
- lack of team effort;
- no potential for waste reduction;
- pay back period was not quick enough.

4.6. CROSS CASE ANALYSIS

There are some differences and similarities in the analysis of outcomes of each Case Study. All three projects were financed by the New York State Empire State Development's Environmental Investment Unit, the state's economic development agency. New York State-ESU was interested in helping small to medium sized companies in waste reduction. The projects addressed issues related to reducing waste at the companies' facilities, changing the operational processing and improving the environmental impact of each company.

The RITEWAYS$ project was not as successful as the Business Waste Reduction projects (Case study 2 and 3). The selection of the companies for the RITEWAYS$ project depended on the personal contacts the project supervisors had. The project supervisors faced a lot of trouble convincing the companies to participate in the project. In some cases they did not know the reasons why the companies were hesitating to get involved in the project. Those companies that did agree to students

coming to their facilities and identify waste reduction opportunities did it because the company management personally knew the project supervisors. Thus, the personal contacts played major role in getting the companies to participate in the RITEWAYS project.

Attracting the companies to participate in the first and second Business Waste Reduction projects conducted by the High Technology of Rochester was relatively easy. The HTR database included 1700 companies in the Finger Lakes region; the HTR had established a good relationship with the most of these companies.

Once again, I would like to emphasize the fact that having company names available in their database helped the HTR to choose the appropriate companies that faced substantial environmental problems. HTR already knew most of the companies in the regions; they have done projects with some of them before and so they had established relationships. It is HTR's business to know these companies and their industry sectors. So, it was relatively easy for them, with their database and with their contacts, to approach potential participants. A good location of the assisting organization and its accessibility also played an important role on companies' decision to become active in the field of environmental prevention.

Each project was conducted in different years. Some of the project supervisors were involved in all of the three projects, which mean that gradually they were gaining more experience in attracting the companies to participate in the

projects, in helping companies with application writing, and in providing technical assistance.

The size of the companies included in each of the projects was important. The companies that had participated in each projects varied in size: small, medium, large. Some of the companies that participated in these projects were small subsidiaries or facilities of very large companies. The larger projects with larger companies were more successful. Obviously, some companies had more immediate waste reduction opportunities than others. The larger companies had more waste generated within their facilities because they manufactured more products. The large companies usually have more employees than smaller ones, and it was easier for them to achieve teamwork, identify additional opportunity and have stronger commitment to the project.[73] Not all smaller companies had the resources to support the project or to stay committed.

In all three projects, there were companies that did not pursue with the implementation of the recommended strategies. The RITEWAYS$ project was ceased after the larger companies started cutting back on their contribution to the project. The money paid by the large companies was used to pay the salary to the co-ops students. The big companies had an environmental department within their facilities, and they did not need students' help any more. The problem with the small companies was that there was not enough work to keep the co-op students occupied throughout the whole school quarter.

[73] Krause, Richard. Final Report. Waste Reduction in Finger Lakes Region. September, 2003.

The Business Waste Reduction projects were more successful than the RITEWAYS$ project. The High Technology of Rochester had experts and analysts who were very experienced in providing technical assistance. They clearly presented the companies' management the potential savings the companies could achieve by implementing the waste reduction strategies. The project supervisors could convince the companies that by reducing the waste stream they could save production costs and the costs paid for sending waste to the landfill. The HTR consultants were more effective in organizing the technical assistance program in three distinct steps: waste assessment, process assessment, and project implementation. This could clearly show at which stage each company had ceased participation. Table 4 includes the number of companies included on each stage of the HTR projects:

Table 4. Outcomes of Business Waste Reduction Projects. [74]

Project	Waste Assessment	Process Assessment	Implementation
Business Waste Reduction Project (1999-2001)	18	16	8
Business Waste Reduction Project (2001-2003)	41	32	9

Even though many of the companies did not go forward with a project, it will be very easy to go back to those companies in the future to discuss the same or other

[74] High Technology of Rochester, Project Summary, (included as an appendix)

issues. If there is another environment related project in the future, companies can easily start with the next step.

Implementing LEAN manufacturing techniques was an essential part of each project. Adopting a consistent approach such as Value Stream Mapping was very effective for finding hidden wastes and costs associated with waste at the facilities of every participating company.

Training of the companies' employees made significant contribution to the project continuation. In the case of the RITEWAYS$ project, only co-op students were trained on VSM techniques; the companies' employees did not receive training on VSM. There was not anyone from the company who could easily continue implementing VSM. After the co-op students left the companies, the company employees did not pursue improving their operational processes. Under the first and second Business Waste Reduction projects, training of work force was an essential process. The companies were able to increase their workforce skills in terms of their ability to help make the process improvement on a continuous basis.[75]

There are number of factors that business managers took into consideration while deciding to get involved in the projects. Table 5 lists the most important criteria that influenced the managers' decision to get involved in these projects.

Table 5. Criteria and Case Studies

CRITERIA	CASE STUDY 1	CASE STUDY 2	CASE STUDY 3

[75] Fink, Mark. Personal interview, Rochester, NY, 10 February, 2004.

Cost	√	√	√
Time	√	√	√
Priority and concerns	√	√	√
Amount of waste and type of waste	√	√	√
Person addressed at company level	√	√	
External relations	√		

The cost was the most important criteria in all three projects, e.g. how much money a company had to invest in a project. Small businesses usually do not have large budgets and their budgets are fixed for each year. Investing in the environmental project did not seem attractive to the company managers. The managers had to see what the financial returns be and what the payback period for their investments would be. For example, if they thought that investing in manufacturing more products would have higher and faster financial returns than investing in waste reduction project, they would not care much for the latter.

In all three cases studies, there was resistance to participation in the environmental projects. Following is the list of reasons that influenced small businesses' managers' decision to participate in the projects:

a) Resources

b) Lack of capital

c) Pay back period was not quick enough

d) Lack of other resources

e) Lack of knowledge

f) Lack of awareness or understanding

g) Unstructured decision process

h) Priority: other important projects

i) Organizational or ownership changes

j) No potential for waste reduction

All these factors have to be taken into consideration before the environmental project managers approach any company with the proposal to participate in the project. Some of the factors do have more influencing character than others. Some factors can be considered from a different angle. For example, it is possible to explain to the business managers that the pay back period does not necessarily have to be quick; the company managers can calculate revenues that will be obtained in the long run, e.g. after the project implementation. Lack of knowledge, awareness and understanding about the environmental issues can also be fixed by providing business managers and staff with the relevant information about the vital environmental problems directly related to their type of business, their service and product specifications.

5. DISCUSSIONS

Each company that had participated in these projects was droved by the potential benefits identified by the experts and analysts. The approach the project supervisors took to address the company with the availability of state fund was similar: they had to show the financial returns companies would gain from getting

active in the project. Only some companies had an environmental staff; most of the companies had environmental staff with little or no experience in waste management techniques. Even if there was an employee who dealt with environmental issues, he/she usually was not the one who is responsible for process design or operations within the companies' facilities. Sometimes approaching an environmental person was a wrong approach, as he/she thought that a company manager would not be satisfied with his/her performance if outsiders find out negative environmental practices within the company's facility. As most small and medium size companies did not have any individual at the company whose job was specifically focused on dealing with environmental issues, most of these firms lacked the knowledge about pollution prevention opportunities. Therefore training the company employees is necessary in any kind of pollution prevention project.

The Importance of Implementing LEAN Manufacturing

The success of Business Waste Reduction projects were based on training the company employees with LEAN techniques; Values Stream Mapping in particular. Once the participating companies understood how to effectively implement VSM, they were able to reveal waste reduction opportunities without further assistance from trainers.

As mentioned above, the RITEWAYS$ projects was ceased, because the companies did not want to pay for the student's service. It would have been wiser if money the companies paid for the students' hours was paid to train at least one of

their employees on LEAN manufacturing techniques. When the students left the small companies, there was not anyone at the company level, who could continue Value Stream Mapping.

The Value Stream Mapping is known as an on-going improvement process. Once a company employee is trained on the Value Stream Mapping, he/she will continuously increase experience. The employee will also be able individually identify things where the waste is created. Value Stream Mapping is a paper and pencil tool that helps to see and understand the flow of material and information as a product or service makes its way through the value stream (Six Sigma Dictionary, 2004).

There are several organizations around the area, where companies' employees can be taught and trained about the LEAN technique and Value Stream Map. One of them is Center for Integrated Manufacturing Studies (CIMS) located in the Rochester Institute of Technology. Our goal is to help industries use advance technology to solve their problems and provide solutions to a lot of challenges they face," said Nabil Nasir who is the director of CIMS center.[76] In the Center for Excellence in Lean Enterprise, the CIMS' workers teach Lean practices to maximize throughput to increase productivity. They also provide Customized Lean training including leader/practitioner training.

[76] Nabil Nasr. Personal interview, Rochester, NY, 16 December, 2003.

6. CONCLUSION

From the case study analysis it became clear that many small and medium sized enterprises were missing opportunities to realize the financial savings they could make only by minimizing waste. One of the reason for their hesitation to get involved in the waste reduction projects was unawareness of these cost saving opportunities; they did not believed that small environmental improvements could lead to significant cost benefits. Swannell (2003) observes: "Why are nearly half of companies unaware of the benefits they can gain via reducing waste disposal costs, raw material inputs, costs of wasted raw materials, energy and time and reusing or selling recovered 'waste' products? In my view it has a lot to do with the fact that many managers still regard the environment as a cost rather than an opportunity for cost reduction." Again, the discussions lead to assumptions that the cost was the main factor, which influenced the managers' decision to act pro-environmentally. Willax (2002) notes: "The biggest commercial market of the world is made up of American small businesses." Therefore, it is essential for federal and state governments to promote the development of small businesses by providing financial and technical assistance. Based on my discussions and conclusions following are the best practices which will help to increase the number of small business to participate in the pollution prevention projects:

1. Help company managers to understand the costs of waste generated within their industrial facilities;
2. Convince the managers that pollution prevention leads to economic progress;
3. Provide on-site technical demonstration on waste reduction techniques;

4. Increase the managers' and employees' environmental awareness by providing information about pollution prevention opportunities.

7. RECOMMENDATIONS

7.1. Recommendations for the Managers of Small Businesses

Every company manager must be aware of environmental aspects of the business. Implementing environmental innovations should stand as a separate objective of a business leader. The earth's scarce resources increase the need to protect the environment and conserve natural resources. It is important for business managers of small companies to be aware of availability of federal and state funds specifically directed to help the companies to implement environmental practices. Following are the recommendations for small business managers, consideration of which will help to improve their competitiveness and profitability:

1. When making decisions to improve environmental aspect of the company, consider the long-term profitability of environmental implementations;
2. Assign at least one company employee with the task of searching the federal and state grants. The employee should be trained with skills on determining the opportunities (federal and state grants) for the company, which will fit within the company operations. The employee should also be trained with skills on writing applications for federal or state grants;
3. Find out if there is a local government agency, a non-profit corporation, an environmental consulting firm or other type of assisting organization which

specializes in assisting small companies to write applications and obtain government grants and establish good relationship with them;

4. Find out if there is a local government agency, a non-profit corporation, environmental consulting firm or other type of assisting organization which specializes in providing on-site technical assistance to small companies establish good relationship with them;
5. Arrange in-person (face-to-face) meeting with the agency manager. Make him/her aware about the industry sector of your company;
6. If a company employee writes an application for federal or state grants, ask the local agency to provide an overview of the proposal's strengths and weaknesses. If an employee receives a feedback from the local agency, that will improve his/her application writing skills for the next proposal submission;
7. When writing an application for federal or state grant make sure your company can handle the work capacity; make sure you will have enough time and resources to allocate to do the project that the grant given for;
8. When the application for federal or state grant is approved, make sure you allocate the certain number of company employees to be able to meet the project requirements;
9. Find out if there is a local government agency, a non-profit corporation, environmental consulting firm or other type of assisting organization which specializes in training company employees on LEAN manufacturing;

10. At least one employee should be trained with LEAN techniques;
11. Control the continuous implementation of Value Stream Mapping.

7.2. Recommendations for the Managers of Assistance Organization

1. Find out most of the small businesses in your area, include them in your database, and establish good relationships with the company managers;
2. Identify the industry sectors of each company and keep the separate database for each industry sector;
3. Search for federal and state grant (fund) announcements directed to assist small business with implementation of environmental strategies;
4. When approaching the small business company managers, provide very detailed cost-benefit analysis. Each potentially selected company should be able clearly see the environmental and financial benefits of pollution prevention innovations for their specific aspect of industry;
5. Help to train company employees on LEAN Manufacturing techniques;
6. After completing the implementation of environmental projects with the companies, make sure the companies continue improving the environmental aspects of their businesses.

7.3. Recommendations for State Governments

1. State governments should development the policies to ensure that companies set pollution prevention goals, and develop plans for achieving them;

2. States should conducts forums for small companies where they can share the information on pollution prevention;
3. Instead of having command-and-control type of environmental regulation, provide financial incentives to small companies;
4. States should increase the number of local organizations (environmental consulting companies, non-profit organizations) which provide on-site technical assistance.

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